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Electrical World

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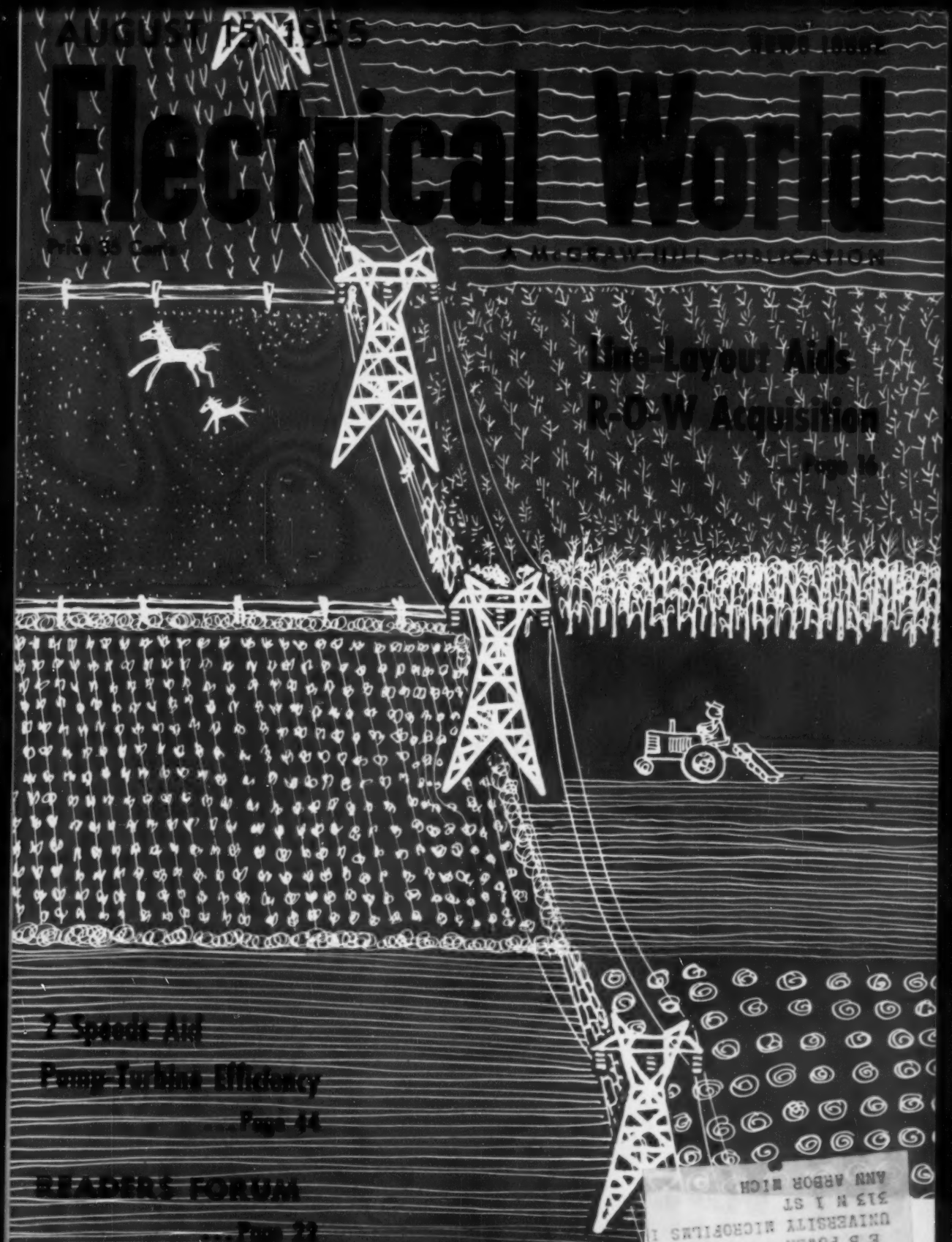

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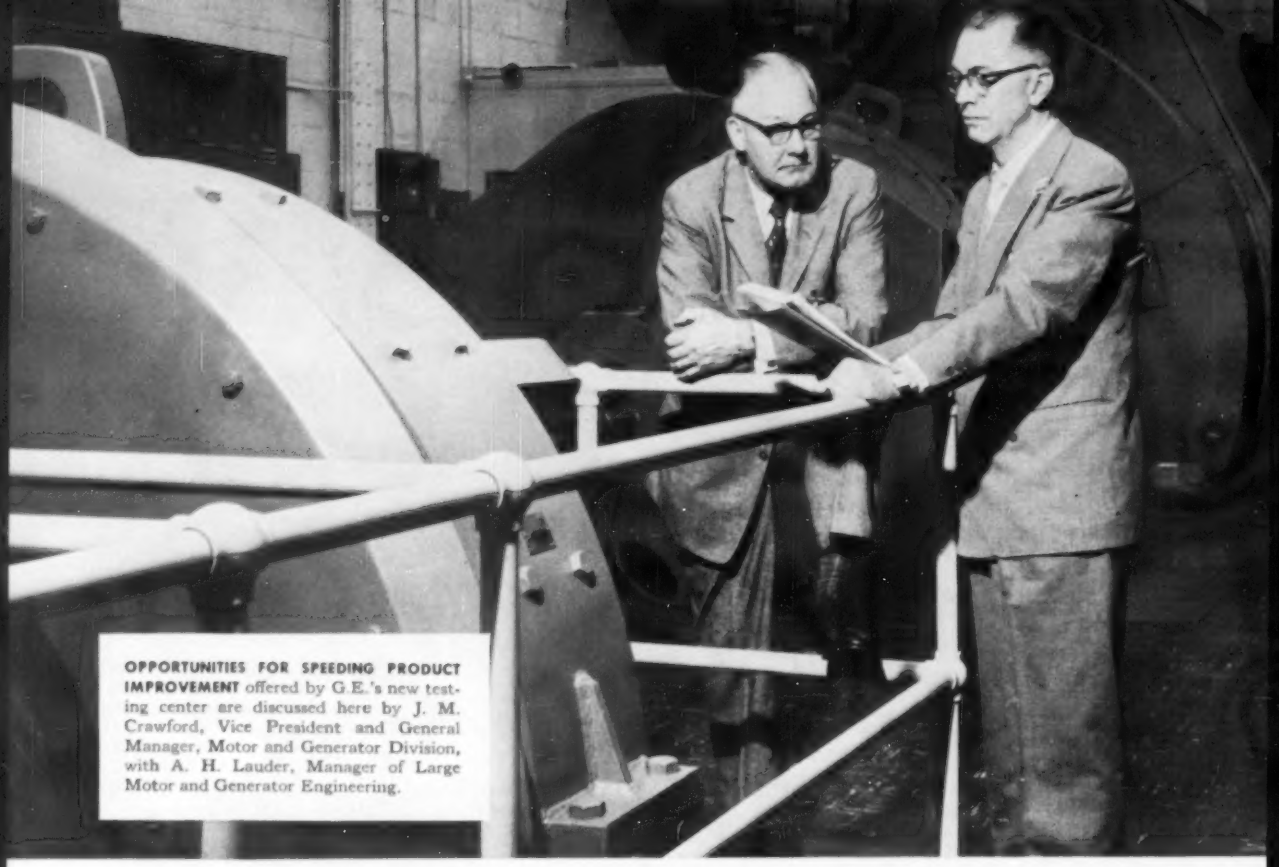

OPPORTUNITIES FOR SPEEDING PRODUCT IMPROVEMENT offered by G.E.'s new testing center are discussed here by J. M. Crawford, Vice President and General Manager, Motor and Generator Division, with A. H. Lauder, Manager of Large Motor and Generator Engineering.

Higher efficiencies, greater reliability, more compact design promised by

NEW APPROACH TO MOTOR AND GENERATOR TESTING

EXTENSIVE FACILITIES are soon to be employed in testing a huge hydro-generator rated at 69,000 kva, the largest generator of its type ever to be assembled and tested in the factory.

With today's load growth placing a premium on the reliability of electric utility equipment, the new $1,000,000 test center recently installed by General Electric's Large Motor and Generator Department offers important new facilities for reducing the possibility of service outages.

PRE-INSTALLATION TESTING

This new center makes possible the testing under simulated load conditions of synchronous condensers up to 70,000 kva, large a-c synchronous and induction motors, large d-c motors, and both a-c and d-c generators. Design engineers are now able to impose conditions more severe than those encountered in the field in advance of actual installation—without waiting for the usual field operation tests.

HUGE GENERATOR TO BE TESTED

Soon to enter the test area is a huge hydro-generator rated at 69,000 kva—the largest generator of its type ever assembled and tested in the factory.

Because such large rotating equipment is custom-built and seldom exactly duplicated, this new test center may be expected to play an important part in helping G-E engineers speed the development of constantly improved apparatus with higher efficiencies, even greater reliability, and still more compact design.

Part of an $8 million expansion and modernization program initiated by the Large Motor and Generator Department, this test facility is further evidence of the efforts being made at General Electric continuously to improve the service and products offered to the electric utility industry. For more information, contact your G-E Apparatus Sales Representative or write General Electric Company, Section 301-300, Schenectady 5, New York.

MORE POWER TO AMERICA

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COMING NEXT WEEK—With customers rapidly increasing their use of electricity, service reliability is becoming more and more important. How companies are securing this will be covered in seven fact-filled articles.

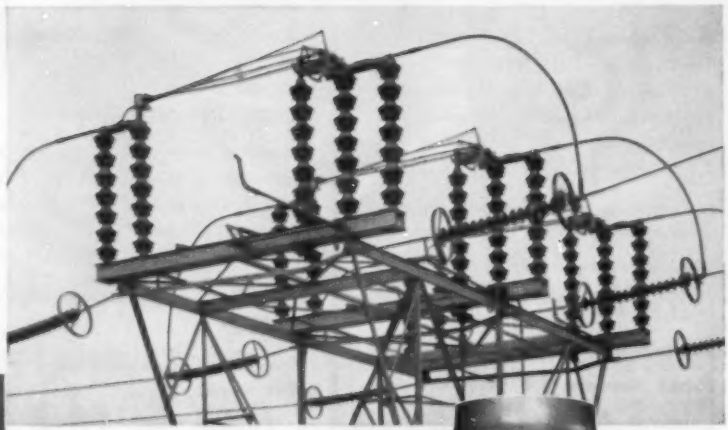
NO. 10 IN A SERIES

A SUB STATION DESIGN ENGINEER ASKS—

"we're interested in higher voltage switch and bus unit operation. Do you have a service record on 220 KV?"

HERE'S OUR ANSWER:

Yes sir! For example, these Pinco 735 units installed at 220 KV by a large eastern utility back in 1929. Operating conditions have been rugged, but these insulators in seven unit stacks have given *twenty-four years of continuous, trouble-free performance* . . . stacks of evidence that Pinco 735's are right *for* the job . . . right *on* the job!



(Right) Rugged porcelain—a balanced design with larger second and center shells—the extra strength and extreme accuracy of assembly . . . all contribute to the trouble-free performance of Pinco 735 switch and bus units.

(Left) Here's a close-up of one of our master jigs in which the 735 unit is assembled. This operation assures exact bolt hole alignment—also cap and pin mounting surfaces are within 3/10,000 of an inch of parallelism.

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RIGHT ON THE JOB—

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Suspension Insulators . . . Clamps and Fittings . . .
Switch and Bus Insulators . . .
Distribution and High Voltage Pin Types . . .
Guy and Tree Insulators . . . Special Porcelain.

Study Hoover Commission Report

Report of the second Hoover Commission on water resources and power (EW, July 4, p 8) makes a distinct contribution to the thinking on federal power policy. Its voluminous background material and thoughtful recommendations deserve the serious consideration of all policy men in the electric industry. Nor can the four dissents to the report be ignored, for they represent potent political opinion groups both within and without the present national administration. The extended dissent of Congressman Chet Holifield, California Democrat, is worthy of note and study for its able presentation of the view of the federal power advocates. It furnishes opponents of the report with ammunition for future battles before Congress.

Of the eight or nine recommendations directly related to federal power activity, electric companies will want to endorse and support a number of them for legislative acceptance. Among these are:

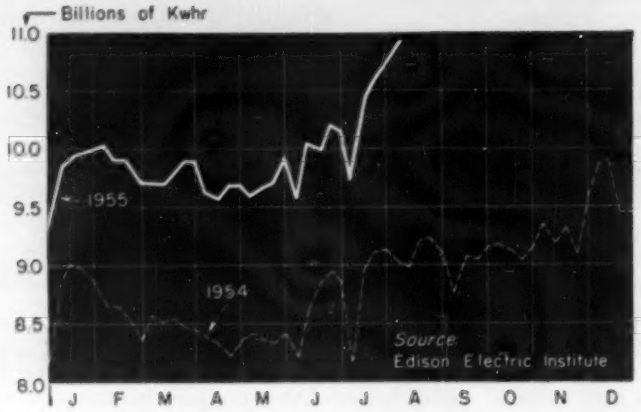
- That before authorization of a water resource project, Congress be given convincing evidence that it is economically justified and financially feasible. Also that federal power rates be subject to the regulation of the Federal Power Commission.
- That in fixing federal power rates the FPC be empowered and directed to set rates at such levels as will eliminate inequities now imposed on the great majority of the people, amortize and pay interest on the federal investment in power plus an amount which will equal federal tax exemption based upon the federal taxes paid by private utilities, and provide payments in lieu of full taxes to state and local governments equivalent to those the private utilities would pay.
- That the federal government or its agencies cease building steam plants and provide for the equation of their power loads by interconnection with the grids of neighboring power systems.
- That the private utilities be permitted to purchase a fair share of federal power and that no further building of transmission lines be undertaken where such transmission service can be provided by non-federal agencies.

Considerable study and soul searching is required before electric company management will want to accept or completely reject other power recommendations of the commission report. These include such important items as the use of revenue bonds to finance water power resource projects, the government incorporation of federal power marketing agencies, the creation of a Water Resources Board in the executive department to determine broad policies for recommendation to the president and to coordinate plans and actions of the various agencies involved in water and power resource development.

In particular, electric company management will want to give careful scrutiny to an alternative recommendation that a system of state compacts, patterned on the one creating the Port of New York Authority, be established to take over the government's power business in each region.

It would appear that this alternative recommendation as well as several other of the proposals would pose a threat to private enterprise and private initiative similar to those posed by federal power activities in the past.

In the months immediately ahead the electric companies must carefully determine their own views on the commission report. They must then prepare to present forcefully and successfully these views to Congress during the coming session when the commission proposals are being considered. Certainly here is an inviting opportunity to strive toward a more fair and equitable federal power policy for all the people.



OUTPUT

Week Ended Aug. 6
10,925,000,000 Kwhr
UP 20.6%

Atomic Energy Commission requirements — 930,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 15.2%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Aug. 6	+20.6	+13.2	+17.2	+38.3	+20.3	+21.7	+8.1	+5.6	+12.4	+10.1
July 30	+17.4	+12.0	+13.3	+31.8	+14.4	+24.0	+2.9	+2.4	+12.4	+5.3
July 23	+16.7	+12.5	+17.1	+30.8	+6.3	+22.0	−3.6	+12.4	+11.1	+7.6

Seasonally Adjusted Index 207.1 Week Ago 202.6 Year Ago 172.2

The Issue's Highlights: FPC unanimously approves Idaho Power's three-dam project for Snake River. Company will begin construction as soon as FPC okays generator plans, says Pres T. E. Roach . . . AEC has approved proposed nuclear power projects by Detroit Edison and associated companies and by Nuclear Power Group led by Commonwealth Edison . . . PS of Colorado finds reading courses cut reading time for its executives . . . Training classes for operating personnel help Rockland L&P start Lovett Plant without trouble . . . Efficiency of pump-turbine at Flatiron Plant of Colorado-Big Thompson Project is improved by running unit at 300 rpm as pump, 257 rpm as generator . . . Northern States Power finds it is easier to acquire rights-of-way by having its transmission lines straddle fences in farm areas . . . California PUC outlines its reasons for granting San Diego G&E rate increase . . . Speakers at forthcoming EEI Industrial Relations Conference will tell how to live profitably under union contract.

NAEC gets Acting Director: National Association of Electric Companies announces appointment of Arthur R. Barnett as acting director. He thus assumes the duties of Pres P. L. Smith who is currently on leave because of illness. The acting director is also secretary-treasurer of the Association. Barnett joined NAEC in October 1945 as a researcher. A graduate of Hiram College, Hiram, Ohio, he did graduate work at Cornell University and was a Brookings Institution fellow. Immediately before coming to NAEC, Barnett was associated with Stephen M. Walter & Associates, a Washington public relations firm.

Atomic Power: AEC Chairman Lewis Strauss in Geneva, Switzerland, has announced publicly for first time the sale prices of nuclear fuels. For uranium containing 20% U-235 the price is $25 for each gram of contained U-235, or $11,362 a lb; for normal uranium metal, $40 a kilogram, or $181 a lb; for heavy water, $28 a lb . . . Other highlights from Geneva: Thorium is likely to outstrip uranium in value as a nuclear fuel; both U. S. and British scientists see "substantial reduction" soon in nuclear power costs . . . Union Carbide & Carbon Corp has consolidated its various atomic activities in a new firm—Union Carbide Nuclear Co.

TVA has placed in commercial operation third unit at Colbert Steam Plant, near Tuscumbia, Ala., and eighth unit at Kingston Steam Plant, each rated at 180,000 kw. System's total rated capacity now stands at 8,484,985 kw. EW erroneously stated TVA's total steam capability as 7,989,985 kw in July 25 issue. This was total capacity at that time and included 3,502,735 kw of hydro power.

Off the Washington Wire: In line with developments at Geneva, AEC has lifted secrecy restrictions on technical uranium extraction process data. This applies only to extraction from raw materials, not refinement. Also announced are rules of practice for its licensing program. These provide for hearings and procedures similar to FPC's requirements on licensing . . . Len Jordan, chairman of American section, Joint International Commission negotiating U. S.-Canadian policy on water resources, is under consideration for Assistant Secretary of Interior to fill vacancy left by Orme Lewis who resigned.

Equipment manufacturers are expanding. Anaconda Wire & Cable has placed in operation new unit producing aluminum wire and cable at its Sycamore, Ill., plant . . . Allis-Chalmers Manufacturing plans to expand its Cedar Rapids, Iowa, plant . . . H. K. Porter has bought Electric Service Engineering of Joliet, Ill. . . . Square D plans to build $750,000 plant at Royal Oak, Mich., to make switchboards, switchgear, and related products . . . Revere Copper & Brass is planning $53-million aluminum plant at Wenatchee, Wash., to produce 60,000 tons a year of ingot.

Massachusetts' Governor Herter has signed a bill calling for study of cost and feasibility of placing power and communication lines underground in the state. A special commission would carry out the survey. This is the outcome of agitation following damage to overhead lines of power and telephone companies in the two 1954 hurricanes.

Indiana PSC has approved purchase of Blountsville, Ind., electrical distribution system by Indiana & Michigan Electric Co . . . Cyrus S. Eaton, director of Kansas City P&L, acquired 2,510 common shares of that company in June, bringing his month-end holdings to 27,610 shares, SEC has reported.

Thirteen electric utilities have been granted total of $167.8 million in rapid amortization certificates by ODM. Expansion programs involved total $297.6 million. Largest construction expenditure will be $132 million by Pacific G&E . . . Superior Judge Charles T. Wright of Olympia, Wash., has taken under advisement request of City of Tacoma that he lift or modify order restraining construction of $134-million Cowlitz River hydro project.

ABOUT PEOPLE IN THE INDUSTRY

Qualifying for classification under heading "Now It Can Be Told," are some statements by Memphis' Mayor Frank Tobey in a recent television program on events leading to cancellation of Dixon-Yates contract. Memphis' decision to build its own plant was "made in Washington when we were definitely told by our Senators and others that it was impossible to get sufficient votes to get the Dixon-Yates contract canceled," said Tobey. City officials also found "objectionable" TVA requirement that city remove 15% surcharge on industrial rates, he added.

Qualifying for classification under heading "Let the Taxpayers Pay for the Big Ones" is philosophy of Sen R. L. Neuberger (D-Ore.) as expressed in recent letter to FPC in support of Pacific P&L's Meadows project on Lewis River. Private utilities can make "major contribution to regional development" by tapping such smaller streams, he wrote, but "great multi-purpose sites like Hells Canyon and John Day on main stem of Columbia and Snake Rivers should be reserved for development by United States government."

More News About People page 36

Construction of Brownlee Dam will Idaho Power's development, FPC end. Sen Wayne Morse (D-Ore.) said

Hells Canyon:

Size—320 ft high by 860 ft long
Initial power installation—272,000 kw
Ultimate power installation—408,000 kw

Oxbow:

Size—205 ft high by 725 ft long
Initial power installation—151,000 kw
Ultimate power installation—226,500 kw

Brownlee:

Size—395 ft high by 1,320 ft long
Initial power installation—360,400 kw
Ultimate power installation—540,600 kw

FPC Okays Utility Plan for Snake

The Federal Power Commission has written the climactic chapter in the long fight over development of the Snake River, one of the nation's last great undeveloped sites for hydroelectric generation.

Unanimously, the five FPC members voted to license Idaho Power Co of Boise, Idaho, to undertake the development by construction of three low dams within a 37-mile stretch of the Snake where it courses through its great gorge to form a natural boundary between Oregon and Idaho.

Private Power Victory

The decision was a monumental victory for private power; a staggering defeat for public power.

An emotional outburst of protests from Congressmen greeted the decision instantly. Public power intervenors in FPC proceedings laid plans for a court fight that could be long.

Almost a decade ago, the Army Corps of Engineers proposed one high dam in the Middle Snake, at the Hells Canyon site, to impound 3.28-million acre-ft of water. It was to be the key project for flood control in the Columbia River Basin. The Snake, largest of the Columbia tributaries, contributes slightly more than one-fifth of the Columbia River run-off, draining 109,000 sq mi.

Flood control and electric power generation became the combination for many a dynamic word battle in the following years. But as time went on, power development became the key issue.

Federal Power Act Sets Key

On that issue, Idaho Power won over public power. The Federal Power Act allows FPC either to set particular water resources aside for federal development or to grant a license for a private entity. This provision, the Commission says, "is in itself an affirmative recognition by Congress that it is not in the public interest for the United States to undertake every water-power development that can be made or to reserve such water-power resources exclusively for federal development merely because they happen to be subject to federal jurisdiction or even because they happen to be included in a federal agency's plans for federal development."

Having thus decided, FPC agreed to license Idaho Power development at the Hells Canyon site, 247.5 miles from the Snake's mouth; the Oxbow site, 273.2 miles from the mouth; and the Brownlee site, 284.6 miles from the mouth.

The FPC staff estimates the dam construction costs at $175.7 million, exclusive of interest during construction, and calculates dam production at $36-million worth of power-at-market annually.

The National Hells Canyon Association, Idaho Power's foremost foe, will meet in Portland, Ore., on Aug. 15 to map its continuing fight. An early objective: An injunction to prevent any work being done by Idaho Power.

Development Timetable

FPC Examiner William J. Costello, after long hearings on the entire fight, had found on May 6 that the Commission should reject public power pleas for a single high dam. He recommended a license for only one of Idaho Power's three projected units—Brownlee. Costello's one-dam finding was overridden by his superiors, the five commissioners.

Idaho Power's development, at least the initial and major phases, involves a timetable calling for completion of the final dam nine years from the effective license date expected to be no later than Oct. 1, 1955.

FPC Okays Idaho Power

from taking action. No one contends

Private Atom Plans

Construction of Brownlee Dam will begin within one year of the license date and completion will be due within another three years. Oxbow construction will begin within four years of license date; completion due within another two years. The Hells Canyon Dam will be started within six years; completion, within another three years.

By terms of its license, Idaho Power must operate the Middle Snake development as part of its own system—and in co-ordination with the northwest power pool. The company will be required to arrange necessary transmission facilities.

Power Distribution

As the specifications show, total installed capacity of the three dams will be 783,400 kw initially, with provision for ultimate additional generating capacity that would run it up by 391,700 kw more—a total of 1,175,100 kw.

Obvious prime market for power from the Middle Snake is Idaho Power's own system, but FPC cited others.

By 1975, the voluminous hearing record shows, Idaho Power will need all output from the three dams.

The company will need the power from Brownlee by the time it can be completed, FPC says, and a substantial portion of the Oxbow output by 1962—the scheduled completion date assuming construction begins by 1959.

Between now and 1975, FPC assumes, there is "a good possibility that power from the three dams which is not needed by Idaho Power in its own system . . . can be disposed of to Utah Power & Light Co, a predominantly steam-electric system and possibly to other utilities."

Politics Past and Present

Idaho Power's plans have long been involved in an emotional complex that is basically political.

Public power advocates — mostly Democrats in Congress aided from the outside by labor organizations, farmer groups, the National Rural Electric Cooperative Association, Public Utility Districts, etc.—have dramatized Hells Canyon, an awesome 7,000-ft deep gorge, as the "last great" power development site left for the United States. They threw their collective weight, both in Congress and in the drawn-out proceedings before FPC, behind the dream for one high dam—722 ft up, 1733 ft across—in the Middle Snake at Hells Canyon.

Idaho Power's development, FPC finds, will give the U. S. one-million acre-ft of flood control storage, at no cost to the U. S., and permit "a reasonably prompt development of a water-power resource now going to waste . . . (while) serving . . . electric consumers in the service area of applicant with the lowest cost power supply that it could develop."

Reaction to FPC's decision came fast, and it was mostly hot. Proponents of the high dam saw the whole affair as politics. "The decision to hand over this resource to a private monopoly was made long ago with the change of Administration," Rep Don Magnuson (D-Wash.) charged.

FPC made its unanimous decision on July 27, a week before Congress adjourned, but didn't announce it until Aug. 4, two days after the session's end. Sen Wayne Morse (D-Ore.) said the "delay" was deceitful—"The Commission quite obviously waited until Congress adjourned to issue the licenses in the attempt to scuttle the high dam at Hells Canyon."

Morse said the majority of the Commission members were "handpicked by the Eisenhower Administration to do this job, and they have done it with hot and unseemly haste."

Four of the five commissioners—Chairman Jerome K. Kuykendall and Frederick Stueck, both Republicans; Seaborn Digby, Democrat; and William R. Connole, an independent—were appointed by Eisenhower. Tenure of the fifth member, Claude L. Draper, Republican, dates back to the Herbert Hoover administration.

Washington was sizzling hot when

(*Continued on next page*)

T. E. Roach Outlines Idaho Power's Development Plans

President T. E. Roach of the Idaho Power Company said, in an interview with EW, that construction on the first two of three authorized dams in the Hells Canyon stretch of the Snake River will begin as soon as the Federal Power Commission approves plans for the power generators.

"We will finance these developments," Roach declared, "in exactly the same fashion as previous developments—by the use of internally generated cash, short term bank loans followed by permanent financing in the form of bonds and stocks.

"No public offering of securities is contemplated until approximately 12 months after start of construction. The company expects to maintain its current capital ratios.

"The unanimous decision of the Commission is particularly gratifying," Roach said. "It was based on the finding, after a most exhaustive study of all evidence, that the company's projects meet the rigid test specified in the Federal Power Act of being adapted to comprehensive development of the river.

"The decision will permit us to take care of power needs which are now acute in our own service area and which within a few years will again confront the Pacific Northwest."

Power plant design plans will be submitted immediately to the FPC, he added.

Barring any further roadblocks in the situation, said Roach, construction will begin before the end of 1955.

FPC Okays Idaho Power

(*Continued from previous page*)

most Congressmen were gone, but there was one on hand to defend FPC. Said Rep Hamer H. Budge (R-Idaho), opponent of the high-dam scheme, "FPC . . . is certainly more capable of making the decision than any member of Congress."

Possible Congressional Action

There is no doubt about one thing: Congress could kill the license.

It could do so by amending the Federal Power Act to forbid specifically the Idaho Power development.

This, of course, presupposes Hells Canyon high-dam strength which most persons acknowledge is not present in Congress. If it were there, one of numerous bills proposing a federal high dam would have passed. There have been plenty of opportunities—in the 81st, 82nd, 83rd, and 84th Congresses.

In the 84th, the first session of which just ended, both House and Senate Interior subcommittees approved legislation for the high dam. But the legislative advance ended.

There is an argument that, because of the subcommittee's actions, FPC was under moral restraint to desist from taking action. No one contends that there is any legal restraint, actual or implied. The argument about FPC's moral duty, of course, is based on the possibility that Congress might have, after all, gone for the federal high dam.

Stacked up alongside the past Congressional record of failures, it appears weak.

Judicial attack on the license also will be made. The National Hells Canyon Association, one of the numerous groups intervening before FPC as an advocate of the single high dam, promised to use every means—political and legal—to fight the license.

Legal Battle Expected

Legally, it will commence with a petition for rehearing, certain to be rejected by the Commission in view of its unanimity on the issue. Then, within 60 days, the battle may be carried to the U. S. Circuit Court of Appeals, with a request that FPC's order be modified or set aside.

A setback in the Circuit Court would, if the public power partisans chose not to give up, push the issue up to the Supreme Court on appeal. But that is predicting judicial attitudes and decisions beyond reason.

Highlights of FPC's Opinion

Intervenors contend that "lower cost power resulting from Federal development, as compared to private development, is needed in the area to attract industry . . . There is no provision (in the Federal Power Act) which leads us to believe that Congress intended that we recommend Federal development for the sole purpose of making power available at cost lower than would be possible if the same water resources were developed by a private entity . . .

". . . If the supplying of power at the lower costs resulting from Federal development should be considered as a decisive factor, there would be few cases involving major power projects where private development could be licensed under the Act because of the substantial difference in annual costs of investment money in favor of Federal over private financing and because of much higher annual cost of taxes paid under private development as compared with freedom of taxes under Federal development . . .

"Intervenors would have us make an economic comparison of the power benefits of the two plans on the assumption of Federal financing for the one-dam plan and private financing for the three-dam plan. Such a comparison would be of little value in determining which plan would be more economic . . . Assuming financing, construction and operation of both plans by the same entity, the ratio of power benefits to power costs of the three-dam plan is greater than that for the one-dam plan . . .

"Congress has nowhere intimated that the adoption of plans by any Federal department shall automatically preclude development of those water resources by any non-Federal entity, if in the judgment of the Commission a license may be properly issued."

Private Atom Plans

. . . given go-ahead by AEC with approval of two utility-group proposals; two rejected

The Atomic Energy Commission has begun staff negotiations with two utilities for construction of central station nuclear power plants. AEC turned down two other applications submitted under its power reactor demonstration program.

Approved because they showed promise of "significantly advancing power reactor technology" were these:

Detroit Edison Co and associates' fast-breeder reactor plant calling for a 100,000-kw installation to be built within Detroit Edison's service area by late 1959.

Nuclear Power Group's boiling-water reactor plant, with a 180,000-kw capacity, scheduled for completion by 1960 at a junction of the Kankakee and Des Plaines Rivers southwest of Chicago. This group is led by Commonwealth Edison Co of Chicago.

Two Proposals Turned Down

AEC turned down proposals by Consumers Public Power District of Nebraska for a 75,000-kw sodium-graphite reactor and Yankee Atomic Electric Power Co for a 100,000-kw light-water moderated plant to be built on the Deerfield River in Massachusetts. However, the agency left the door open for talks to determine whether Consumers' and Yankee's proposals can be changed.

No reasons were given for rejection of the two proposals. AEC has been holding discussions with all four applicants for several months, because each fell short of AEC's original aims. Apparently Detroit and Commonwealth altered their plans sufficiently to satisfy AEC's technicians.

Negotiations with Detroit and Commonwealth concern, in part, these forms of federal aid for which the groups qualify.

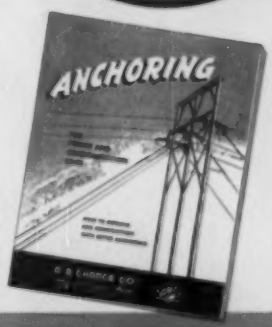
- Charges established for loan of nuclear fuels will be waived for up to seven years. However, the groups will still have to pay for fuel consumed.
- The companies will be able to use AEC laboratories without charge or for slight fees.
- They will receive payment for technical and economic information obtained by AEC from their plants.

Give the Guy a CHANCE

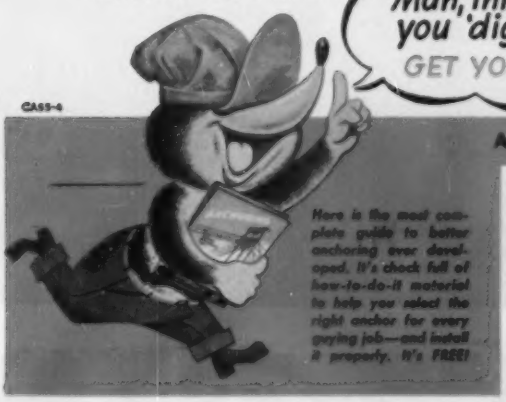
When anchor users make a study of earth anchors—make their own pull tests for holding power—make their own comparisions . . . we're happy, because the Chance 8-Way almost always takes top position for holding power and ease of installation.

Such tests prove that the 8-Way holds far more than its rated load because its *eight* blades expand to form a complete pyramid shaped square—there is no wasted space between blades. The guy load is distributed to all *eight* blades all the way around the hole.

Chance 8-Way Anchors are available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying. Your Chance Anchor Distributor can supply you from stock. *Specify Chance for Service!*



MIKE THE MOLE SAYS:



"Man, this book can help you 'dig' anchors better. GET YOUR COPY TODAY."

CA55-4

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's FREE!

A. B. CHANCE CO. • 205 N. ALLEN ST. • CENTRALIA, MO.

O.K. Have "Mike" send us_____copies of "ANCHORING"

NAME_____

COMPANY_____

ADDRESS_____

CITY & STATE_____ CA55-4

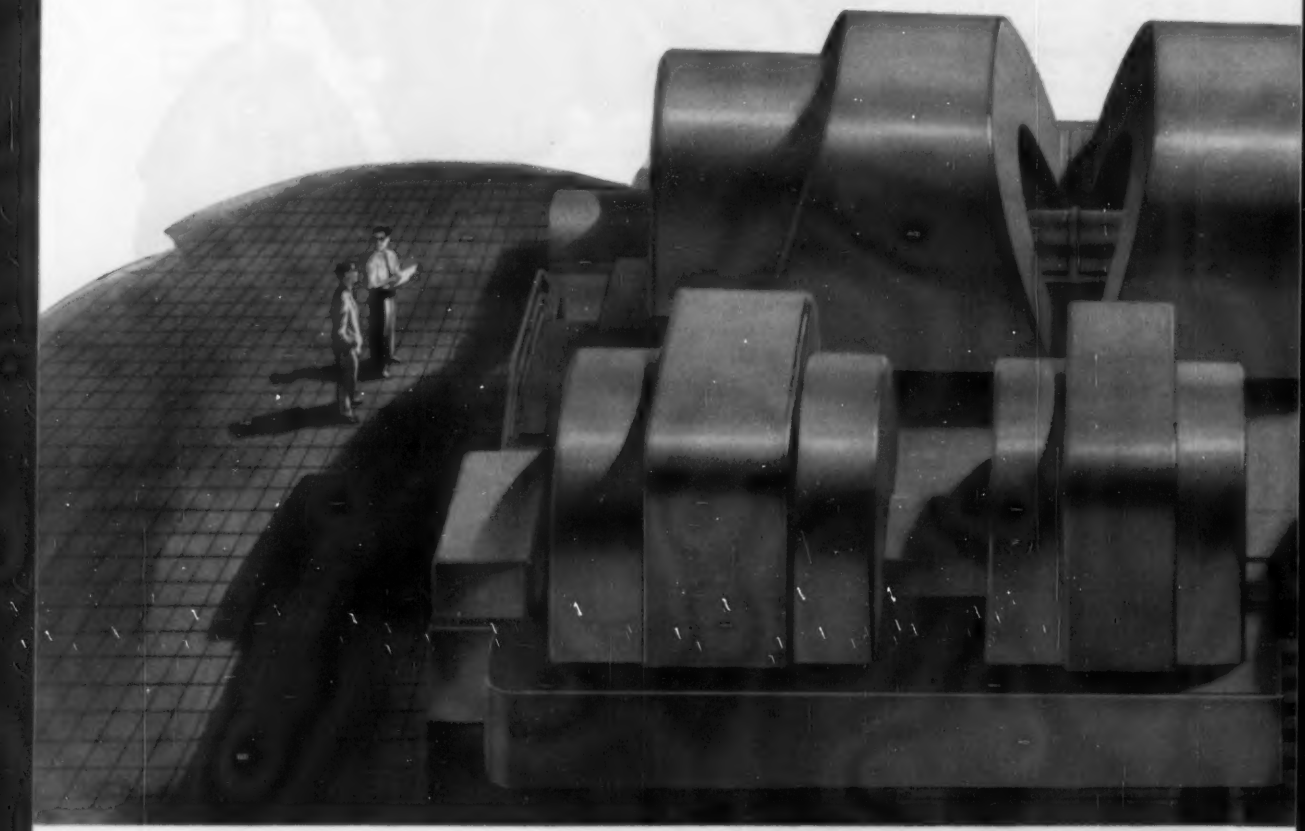
300,000-Kw Steam Turbine Generator

New In Power

The illustration below shows a model of a 300,000-kw steam turbine generating unit being built by Allis-Chalmers for Detroit Edison. Its capacity is far higher than that of any steam turbine generating unit yet built. It is capable of supplying the needs of a city of half a million people.

When this new unit goes into operation, the total capacity of the Detroit Edison system will be more than 3¼ million kilowatts — double the system's capacity of ten years ago.

Many features of this unit are examples of Allis-Chalmers developments that help utilities keep pace with our expanding economy. The unit is close-coupled, cross-compound reheat design, with two generators, one on the 3600-rpm shaft, one on the 1800-rpm shaft. The 3600-rpm generator is fully supercharged, taking advantage of an



A-C ALLIS-CHALMERS

ALLIS-

Paces Utility Progress

Era Generation

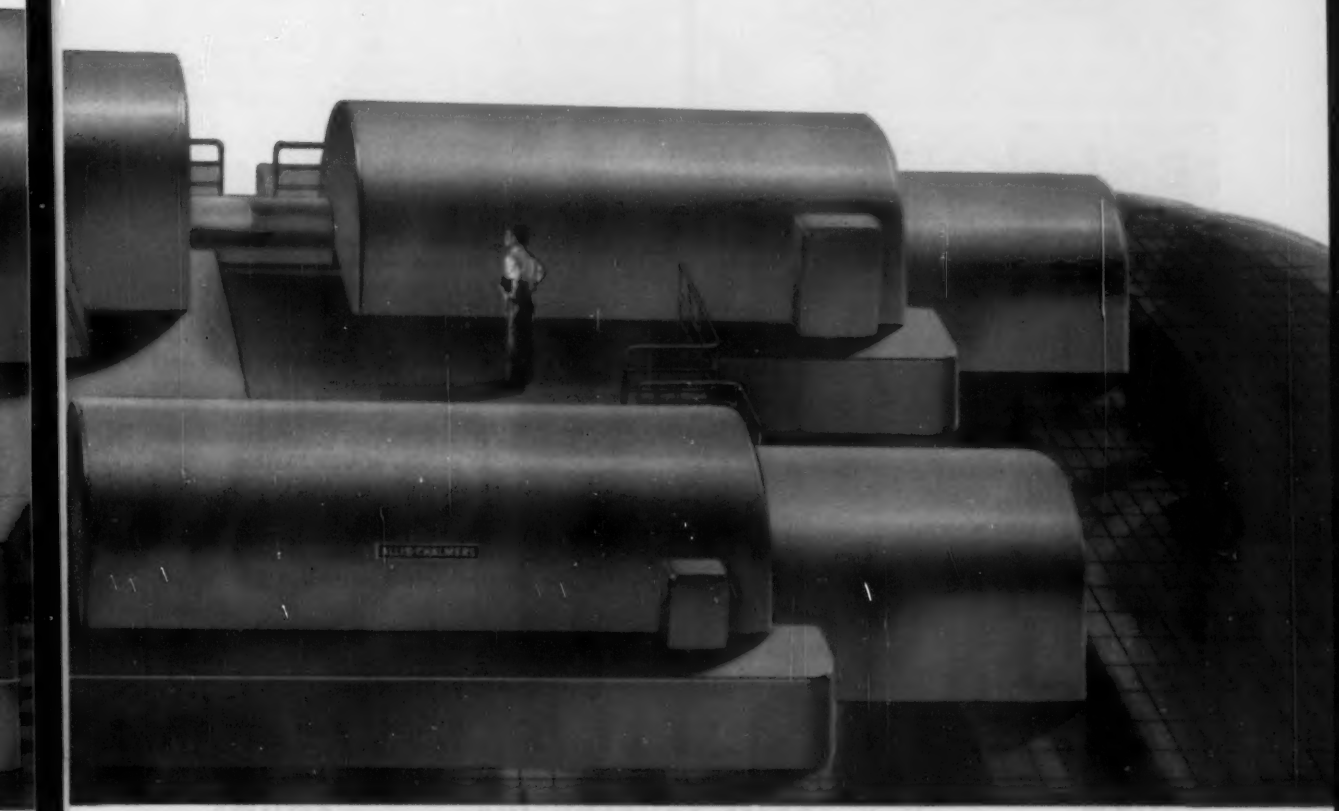
Allis-Chalmers development that makes possible higher capacities and smaller relative sizes.

The fully supercharged 3600-rpm generator is rated 206,470 kva, 0.85 power factor, 0.80 short circuit ratio, at rated hydrogen pressure. The 1800-rpm generator is a conventional hydrogen-cooled machine that is rated 171,765 kva, 0.85 power factor, 0.80 short circuit ratio, at rated hydrogen pressure. Operating steam conditions are 2400 psig, 1050 F at inlet; 1000 F reheat; and 1 inch Hg absolute exhaust pressure.

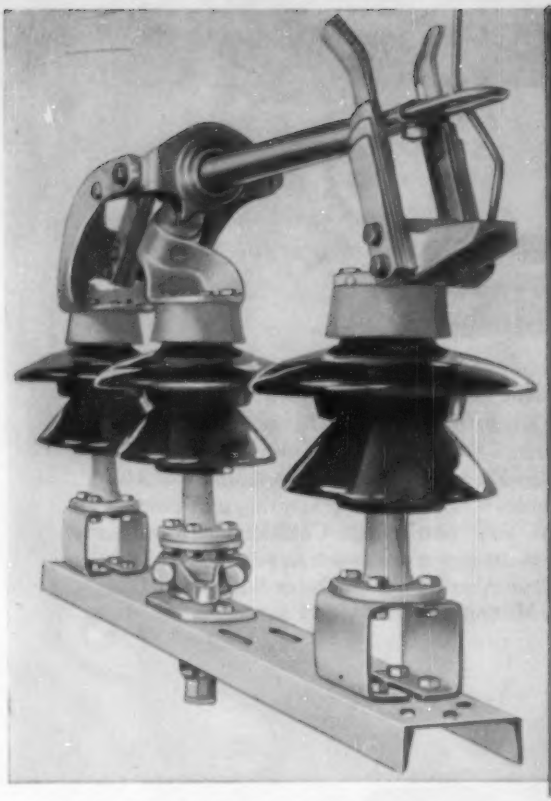
* * *

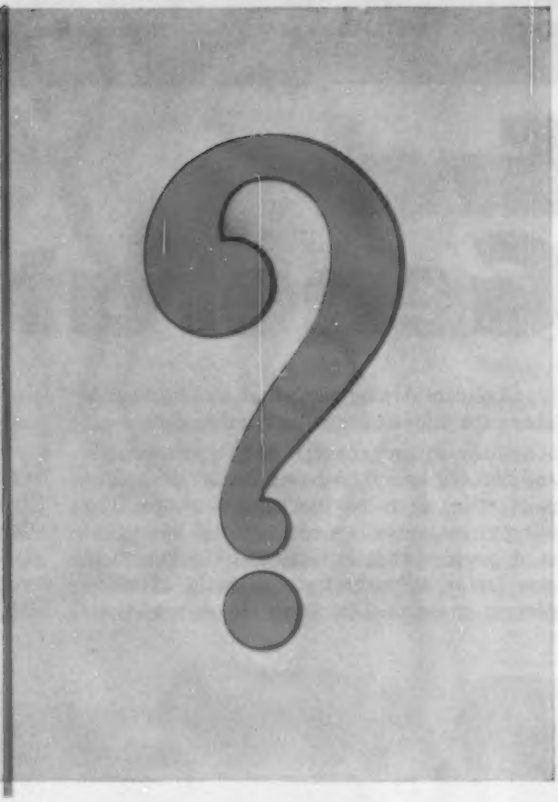
If you would like more information on Allis-Chalmers steam turbine generating unit developments, your nearby Allis-Chalmers office will be glad to arrange a discussion at your convenience. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4794



CHALMERS





Do look-alikes always perform alike?

DELTA-STAR
MK-40 Switches
–often imitated
–even copied
–never equaled

In the case of Delta-Star MK-40 Switches, you always can expect consistent performance, one switch to the next. The engineering and design experience, the skill and care, and the quality of Delta-Star workmanship and materials assure permanent, high performance.

Moreover, Delta-Star MK-40 Switches alone offer a combination of unbeatable advantages *originated by Delta-Star.* These switches have a minimum number of moving parts, minimum current interchange surfaces, fully controlled blade with high pressure silver-to-copper contacts at both ends. Contacts are fully visible for inspection. Contact pressure applying springs carry no current, and offer large deflection to maintain uniform high pressure contact over extended periods of wear. MK-40 Switches feature sturdiest possible construction, using large rugged sealed-type ball bearings.

Switches that look like Delta-Star's MK-40 don't necessarily perform the same. Even minor changes in bearing centers, or an extra link in the mechanism only introduce needless complications and small parts that may detract from top performance.

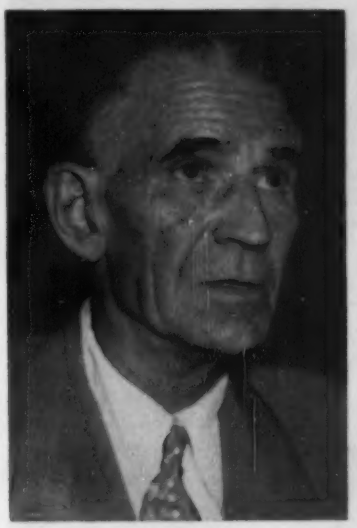
Delta-Star MK-40 Switches firmly remain the *standard of comparison.* Consistently they're your best buy.

When you want the best in high-voltage equipment specify DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

HKP

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities



Harold C. Patterson . . .

Approved for SEC

Harold C. Patterson, a Washington, D. C., investment executive, is the new member of the Securities and Exchange Commission, replacing Paul R. Rowan, outgoing Democratic member.

The Senate confirmed Patterson's nomination for a five-year term in the closing hours of Congress. It was over the objections of Democratic members of the Senate Banking Committee, which had favorably considered the nomination with an 8-6 split.

But Patterson, a resident of Virginia, had the support of Virginia's Democratic senators, Harry F. Byrd and Willis Robertson. Robertson joined seven Republicans in the Banking Committee in recommending Patterson, against six Democratic opposition votes.

The opposition argued: (1) That Patterson, as a nominee for one of the two Democratic seats on the Commission, was in fact an Eisenhower man, although a registered Democrat; and (2) that he and the other four commissioners have only a business background, which weighs the SEC on one side.

Patterson, a former member of a Washington brokerage firm, has been associated with the National Association of Securities Dealers. He is a member of the American Stock Exchange. Last year he joined the SEC as director of the Trading and Exchange Division.

Atom Course to be Launched

. . . in September by AIEE's New York section; two-part program consists of fall and winter sessions with 12 lectures each

A full year's education program covering "The Principles and Engineering Application of Atomic Energy" will be launched this fall by the New York Section of the American Institute of Electrical Engineers. The program is under the sponsorship of the Educational Committee of the Power and Industrial Division.

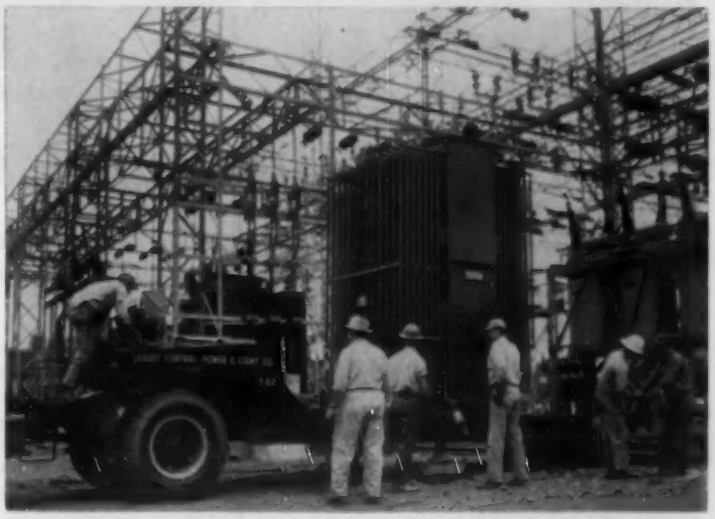
First half of the program will get underway with a series of 12 weekly lectures starting Sept. 27. It will open with a discussion of the Atomic Energy Act of 1954 by C. Robbins, executive manager of the Atomic Industrial Forum.

After a brief review of theory by Prof R. Wayne Houston of Columbia University, Walter F. Friend, Atomic consultant for Ebasco Services, Inc, will discuss raw materials.

Specific problems encountered in reactor design will be discussed by R. L. Mela, senior engineer, Nuclear Development Associates; Donald White, Knolls Atomic Laboratory of General Electric Co; J. R. Menke, president of the Nuclear Development Associates; and J. W. Landis, sales manger of Atomic Energy Division of Babcock & Wilcox.

Reactor types and applications will be discussed by R. M. Gould, manager of Nuclear Products, Foster Wheeler Co; D. M. Schoenfeld, manager of Nuclear Power Division, Combustion Engineering Corp; Dr Clark Williams, Brookhaven National Laboratory; Dr William M. Thompson, chief engineer, Walter Kidde Nuclear Laboratories; and Samuel Untermeyer, II, Atomic Power Group, General Electric Co.

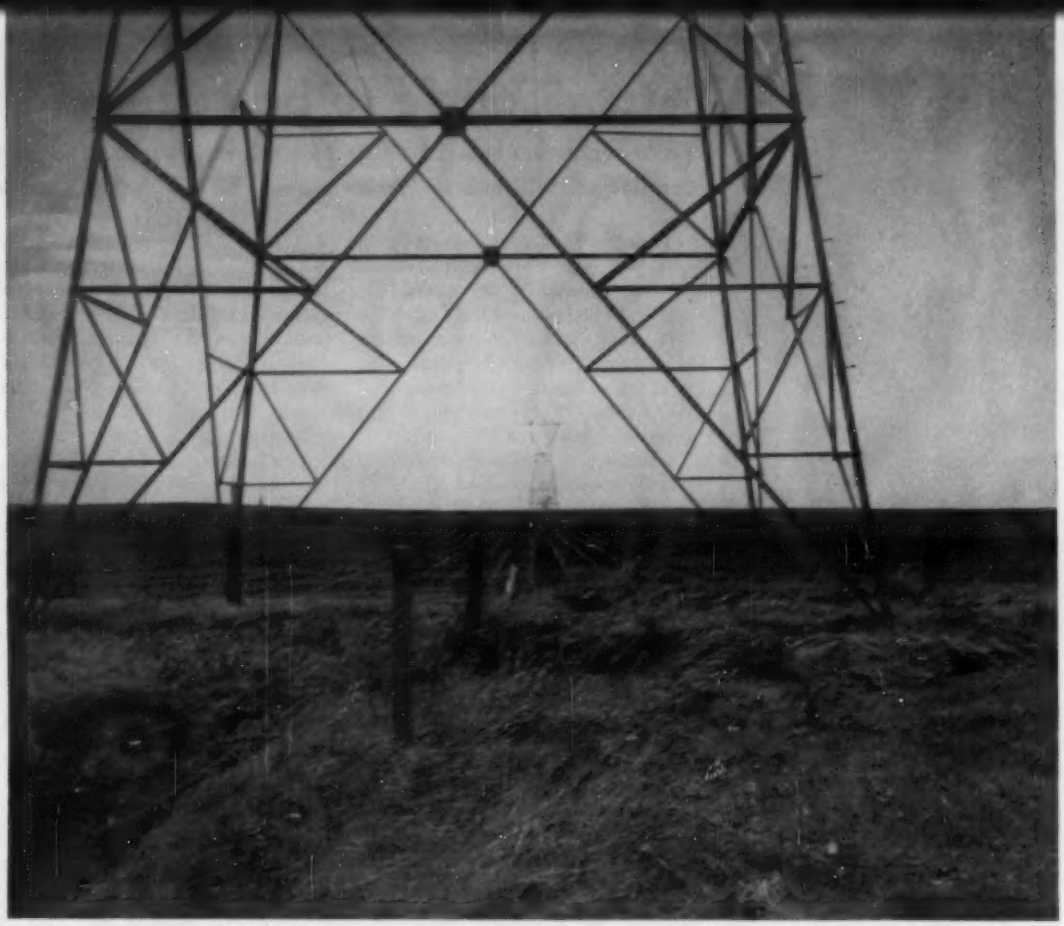
The fall presentation will be followed by a spring session, also consisting of 12 lectures.



JCP&L Transformer Built in Five Days

A 5,000-kva transformer, ordered by Jersey Central Power & Light Co, was built from scratch in just five days. The unit was ordered by the utility after a fire caused extensive damage to its Traynor substation at Summit, N. J.

The 34.4-kv three-phase transformer, shown above being unloaded at the substation, was built by the General Electric Co's medium transformer plant in Rome, Ga. Nothing was "borrowed" from similarly rated units since none were in production at that time. The job was completed in five normal working days, GE stated.



CORNERS OF FENCES AFFORD TOWER SITES LEAST INTERFERING WITH OPERATIONS ON THE AREA'S FARMLANDS

Line Layout Aids ROW Acquisition

TRANSMISSION
Design

Northern States' towers at quarter-section lines give nominal 1,320-ft spans, suit farm pattern, leave farming unencumbered

G. R. COLEMAN, Line Superintendent, Construction, Northern States Power Co, Minneapolis, Minn., and

L. L. ELLSWORTH, Transmission Engineer, Pioneer Service & Engineering Co, Chicago, Ill.

Northern States Power Co laid out its 114-mile, 230-kv Black Dog-Minnesota Valley line to minimize interference with the area's farm operations. This design philosophy, prompted by a study of aerial photographs, proved helpful subsequently when the company approached farmers to negotiate for right-of-way.

In routing the line, planning engineers used aerial photographs taken along some 70 miles of the area to be traversed. These photos, scaled 800 ft to 1 in., were matched, stapled together, and fastened to the top of a table. A fine fish line, weighted at each end, was placed over the pictures lengthwise on the table. Using pins to hold the fish line in place at required points, the planners then established a tentative route for the transmission line.

This initial route cleared major obstructions, such as lakes and small towns. Then planners gave detailed study, using stereoptical mirrors, to clearing farm buildings, schools, cemeteries, and flight strips for small planes.

Fits Farm Pattern . . . The route selected does not deviate from a straight line by more than half a mile over about 90 miles of its length. This major portion traverses land that is farmed and fenced in very regular patterns conforming to sections, half and quarter sections, down to 40-acre fields, in which the normal length is 80 rods, or a quarter of a mile. This farmland pattern suggested placing towers at quarter-mile intervals to meet natural farm boundaries and brought about the subsequent easing of right-of-way negotiations.

Spans of 1,000 to 1,200 ft were normal on other utility company 220-kv lines. With this as a precedent Northern States Power designed its own lines for a normal span of 1,320 ft (¼ mile). Possibilities of this span length were discussed with conductor and tower manufacturers, and the

economics of such a design were investigated. As the findings were favorable, the nominal 1,320-ft span was chosen. Average span is 1,288.6 ft.

Design Features . . . Although network analyzer studies indicated a conductor size of 636-MCM ACSR would be suitable, 795-MCM ACSR was installed. This size assures adequate capacity for unforeseeable future load.

Ultimate strength of 795-MCM ACSR 26/7 stranding is 31,200 lb. Design was based on a tension of 12,480 lb, which is 40% of the ultimate strength. Shield wires were stressed on a basis of 40% of ultimate strength under heavy loading conditions.

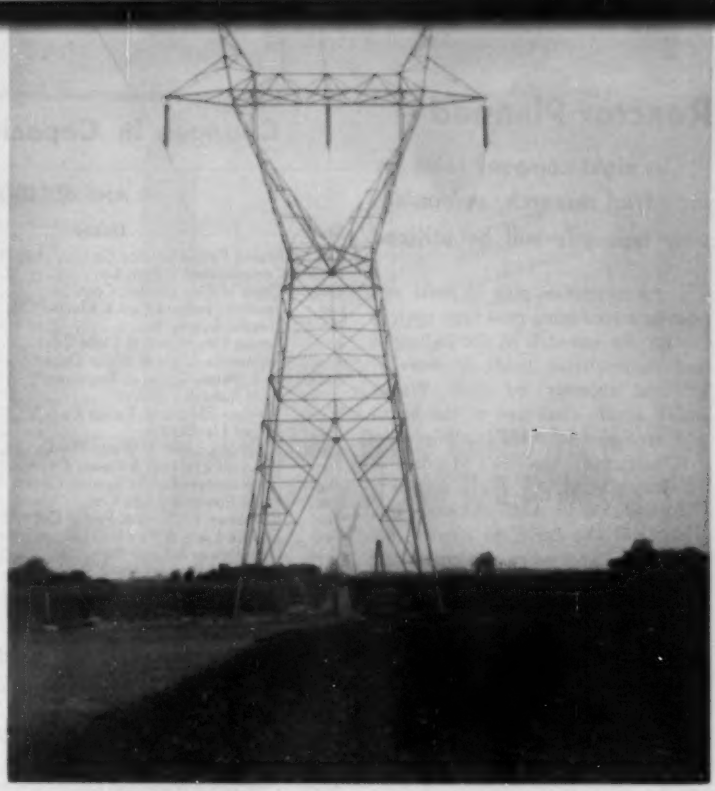
Records indicated that ground resistance throughout the area, except at a few spots, would be 10 ohms or less. On this basis, together with the tower spacing proposed, the design provided for 16 insulator units per string. Tower top spacing of shield wires and conductors is 25 ft. At midspan (1,320-ft span at 60 F temperature) the spacing is approximately 35 ft. The resulting lightning protection level is in the order of 16,000 kv which should give a probable outage of one per 100 miles per year. The area has about 40 storms per year.

According to test results, the general level of footing impedance is 5 ohms or less. Annual outage of the line over its 114.22 miles has been estimated at less than one per year.

Tower heights from crossarm to ground line vary from 80 to 110 ft, normal height being 90 ft. Horizontal phase spacing is 27 ft 10 in. The soil permits use of steel grillage footings on all towers except the dead-end and corner units which are grounded to four 20-ft ground rods. Of 469 towers in the line, only 11 are on concrete foundations. From the corner tower adjacent to the Minnesota Valley Substation to the river bottom near Shakopee, the line has no dead-ends for approximately 96 miles.

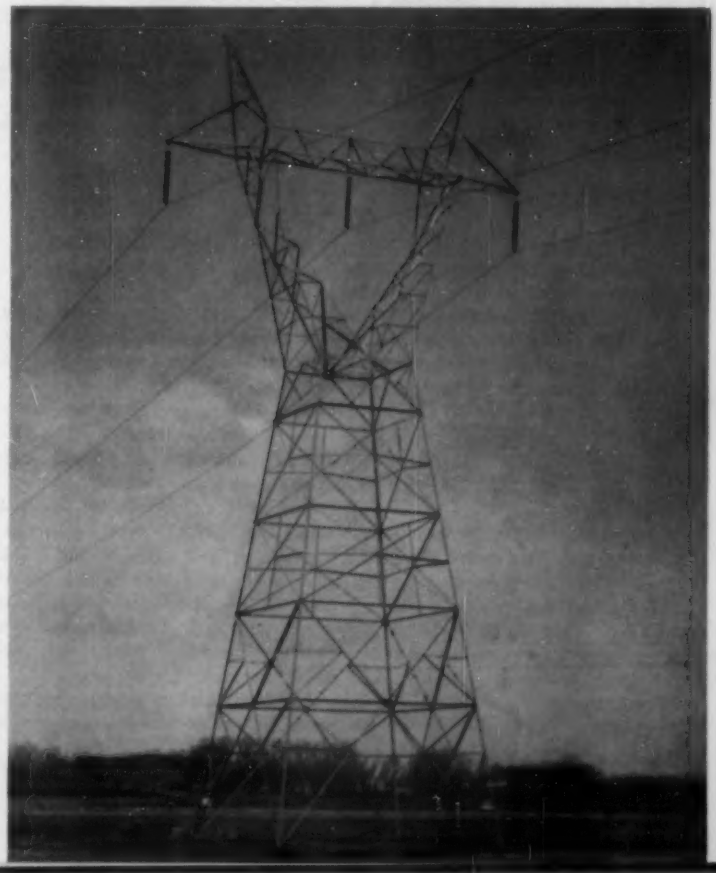
Right-of-Way Changes . . . As the right-of-way and engineering departments worked in close cooperation throughout the job, many changes in tower location were made to satisfy property owners; and some sections of the line were even rerouted.

For dealing with property owners, the right-of-way department was equipped with a complete set of aerial photographs enlarged to a scale of 400 ft to 1 in.



FENCE LINES are straddled by tower lines so that minimum usable land is removed from farming, and farmers generally accede to requests for right-of-way

LEAST PRODUCTIVE LAND for use as tower sites can be acquired without much difficulty, and utility by careful planning directs line through such places



Reactor Planned

. . . by eight-company team for industrial research; swimming-pool type pile will be utilized

Eight companies plan to build and operate a swimming-pool type nuclear reactor for research in the industrial and humanitarian fields, it was announced recently by Gen Walter Bedell Smith, chairman of the board and president of AMF Atomics Inc, a subsidiary of American Machine & Foundry Co.

In addition to AMF Atomics Inc, which will also build the reactor, the companies expected to participate are: American Tobacco Co; Continental Can Co; Corning Glass Works; International Nickel Co; Chas. Pfizer & Co, Inc; Socony Mobil Oil Co; and U. S. Rubber Co.

The Industrial Reactor Laboratories, as the planned facility has been designated, will be located on a 250-acre site. Options have already been taken on two sites, one in New Jersey and one in New York, both within 50 miles of New York City. The facilities are expected to cost between $1.5 and $2 million. Construction is scheduled to begin in early fall and operations, a year later.

The laboratories will be directed by a leading university according to a policy to be established by a board of directors representing the participating companies. Ownership will be vested in a corporation in which the eight companies will have equal shares of stock.

Each company will be free to perform its own research aimed primarily at the development of new products or new manufacturing methods.

The reactor, a swimming pool type, uses uranium fuel surrounded by water serving as a moderator, cooler, and shield.

Generator Contract Let

Contract for a 60,000-kw steam generating unit has been awarded Fluor Corp, Ltd, Los Angeles, by the California Electric Power Co, Riverside, Calif. The unit is the first of four scheduled for installation at a plant site in southern California. All four generators will cost an estimated $35 million.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING JUNE

State	Utility	Plant	Fuel	Capacity (Kw)
Me.	Maine Public Service Co	Caribou	S	12,650
N. Y.	Consolidated Edison Co	East River	S	180,000
Ohio	Ohio Valley Electric Corp	Kyger Creek	S	180,000
Ind.	Southern Indiana Gas & Electric Co	Culley	S	40,000
Ill.	Electric Energy Inc	Joppa Steam	S	156,250
Mo.	Kansas City Power & Light Co	Hawthorn	S	100,000
Mo.	Unionville Light & Water Dept	Unionville	IC	970
S. D.	U. S. Army Corps of Engineers (Fort Randall Project)	Fort Randall	H	40,000
Va.	Virginia Electric & Power Co	Possum Point	S	100,000
Fla.	Tampa Electric Co	Hookers Point	S	60,000
Okla.	Waynoka Light & Water Plant	Waynoka	IC	860
Tex.	Houston Lighting & Power Co	Deepwater	S	156,250
Tex.	Southwestern Public Service Co	Plant X	S	100,000
Tex.	Texas Power & Light Co	Collin	S	125,000
Tex.	Robstown Lighting & Power Dept	Robstown	IC	1,000
Tex.	Teague Light & Power Dept	Teague	IC	785
Utah	Utah Power & Light Co	Gadsby	S	100,000
Calif.	Bureau of Reclamation	Nimbus	H	6,750
Kan.	City of Hoisington	Hoisington	IC	1,400
Okla.	Marlow Electric Department	Marlow	IC	1,800
Tex.	Winters Light & Power Plant	Winters	IC	600

RETIREMENTS

Ohio	Ohio Power Co	Findlay	S	4,000
Ohio	Ohio Power Co	Lima	S	1,000
Iowa	Corn Belt Power Cooperative	Eagle Grove	IC	1,760
Kan.	Garnett Municipal Light & Water Dept	Garnett	IC	240
Okla.	Public Service Co of Oklahoma	Hugo	S	500
Okla.	Public Service Co of Oklahoma	Lawton	S	750
Minn.	Hutchinson Municipal Electric Department	Hutchinson	IC	430
Mo.	Empire District Electric Co	Grand Falls	H	1,000
Okla.	Marlow Electric Department	Marlow	IC	250

U.S.	Hydro	Steam	IC	Total
Added	46,750	1,310,150	7,415	1,364,315
Retired	1,000	6,250	2,680	9,930
Adjustments Plus	.....	1,000	10,743	11,743
Adjustments Minus	10,900	61,250	1,023	73,173
Net Change	34,850	1,243,650	14,455	1,292,955

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of July 1—Hydro, 23,929,652 kw; Steam, 81,362,073 kw; IC, 2,325,508 kw; Total, 107,617,233.

New Arterial Lighting Prescribed for Phoenix

Almost 14 mi of new arterial street lighting has been recommended for Phoenix, Ariz., during the 1955-56 fiscal year.

Glen Kiger, city electrical supervisor, also recommended 700 additional intersection and mid-block lights for residential areas.

The new lights will be financed within the $273,438 street-lighting allocation in the city's budget. The city's lights are installed under a contract with Arizona Public Service Co which puts in the lights at its own expense, maintains them, and furnishes electricity for the city.

In return, the City pays for maintenance, interest on the power company's investment, and electricity. The City holds option to buy the street lights from the power company at their appraised value any time before the contract runs out. The term of the contract will be 16 years.

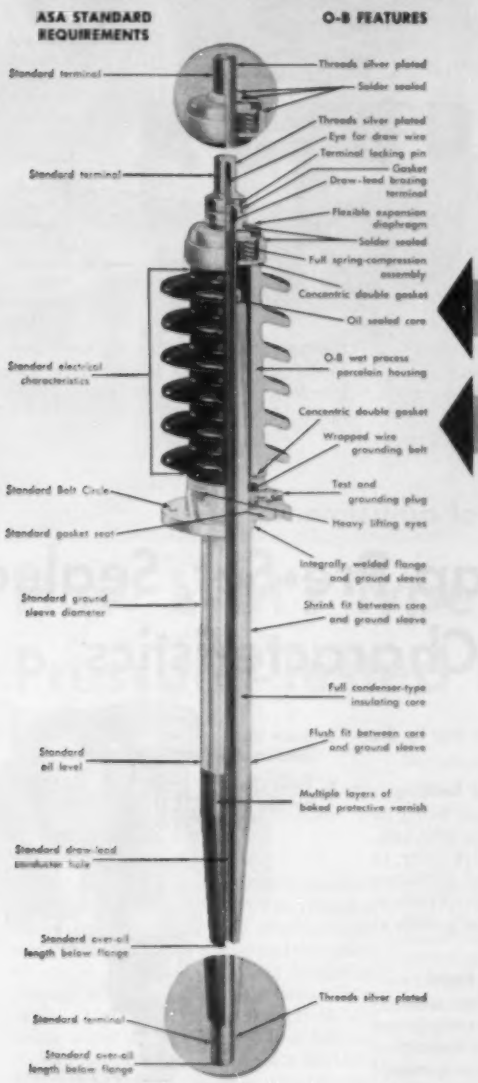
REA Loan for Garkane

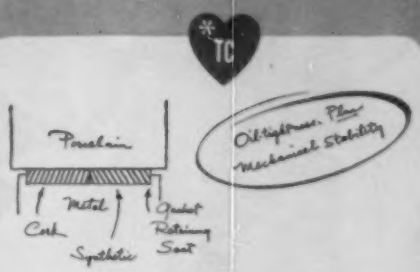
Power self-sufficiency will be attained by Garkane Power Association, Inc, with the help of a $1.2-million loan from Rural Electrification Administration. The Richfield, Utah, utility will use the money to build a 3,000-kw hydro plant on Boulder Creek. Garkane now buys about 80% of its power from Telluride Power Co, also in Richfield.

FEATURES OF

O-B'S NEW ASA STANDARD BUSHINGS

(Drawn-lead transformer type in full view. Fixed conductor type in insets)





Ingenious Double Gaskets Add to Reliability of New O-B Bushings

In addition to its electrical function, oil in O-B's new ASA Standard bushings establishes a "dry" environment for the wound paper condenser-type insulating core. Since air containing water vapor would replace any oil loss, efficient sealing becomes a vital part of modern bushing design.

To compensate for dimensional differences due to thermal expansion, and for the inevitable slight loss of gasket volume, positive controlled follow-up pressure is obtained by full spring compression assembly.

Special oil-tight gaskets are an ingenious new development in the O-B bushing. Cork has high compressibility. Synthetics have ideal sealing power. The simple expedient of two concentric rings, one of each material produces a mechanically stable and oil tight joint. The two substances perform their best function independently, and joints are maintained at optimum working load by adequate follow-up spring pressure.

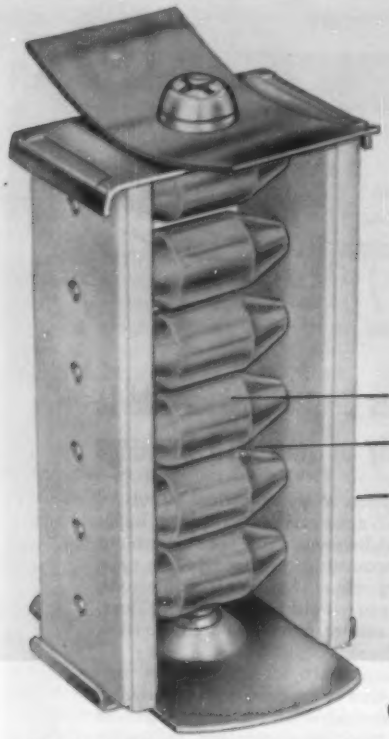
Result of this new sealing technique is a permanently reliable oil-tight joint -- a permanently reliable "dry" environment for the insulating core.

To get this and many other modern features of design, be sure to *specify* O-B's new ASA Standard bushings on your requirements for transformers and circuit breakers.

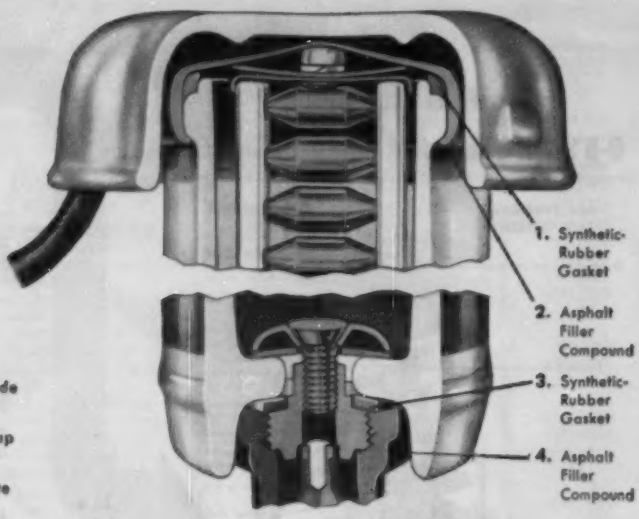
TECHNICAL COMPETENCE

the heart of every *Ohio Brass* bushing

4527-H



L-M's precision spark gap structure is made of electrode members accurately spaced and supported by a frame of high-grade steatite.



Permanently Sealed, L-M's spark gap cannot be knocked or burned out of adjustment. Not affected by weather, corrosion, birds, bugs, etc.

Cannot get out of adjustment...

L-M's Valve Arrester Gap Pre-Set, Sealed, To Assure Unchanging Characteristics

By **ROBERT W. KELLY**
Application Engineer
Protective Equipment
Line Material Company

You can always be sure of optimum balance between 60-cycle sparkover and impulse sparkover with L-M's Valve Type Arrester.

L-M's spark gap is precision made, preset, and then permanently sealed in the arrester housing. It cannot be knocked or burned out of adjustment. It is not affected by weather, corrosion, birds, bugs, etc. The sealing prevents corrosion, and thus prevents radio noise.

Gap of Heavy-Duty Construction

L-M's spark gap structure is a ladder gap design, made of solid brass electrode members. These are accurately spaced and supported by a frame of high-grade steatite. This heavy-duty unit transmits severe discharges without burning or pitting, and allows the arrester to go into action fast.

Permanently Sealed At Each End

The arrester is sealed at the top by a heavy synthetic-rubber gasket between the copper cap and the seat on the housing. The cap is spun onto the glass housing while pressure is applied to compress the gasket.

The bottom of the arrester is also sealed by a heavy synthetic-rubber gasket which is compressed against the glass seat by the Isolator assembly.

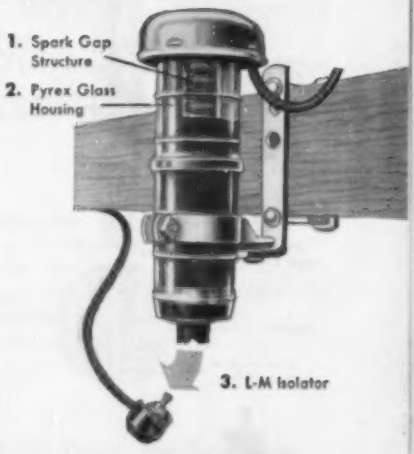
100% Tested For Positive Sealing

All of L-M's Valve Arresters are tested by applying air under 15 pounds pressure, while the arrester is submerged in water, to see whether any bubbles appear, indicating air leaks. Since the valve material is porous, this air-pressure test checks the gaskets at both ends of the arrester.

Visual Testing In The Field

Should the spark gap ever become damaged by any cause, permanent telltale evidence can be readily seen through the Pyrex glass housing. If the valve element is damaged and the spark gap fails to extinguish 60-cycle power follow current, the heat from the additional current across the Isolator gap explodes a small charge of non-aging gunpowder, which is permanently sealed in the Isolator.

This ruptures the Isolator housing and blows the ground lead terminal free, giving complete isolation and ready identification of the faulty arrester.



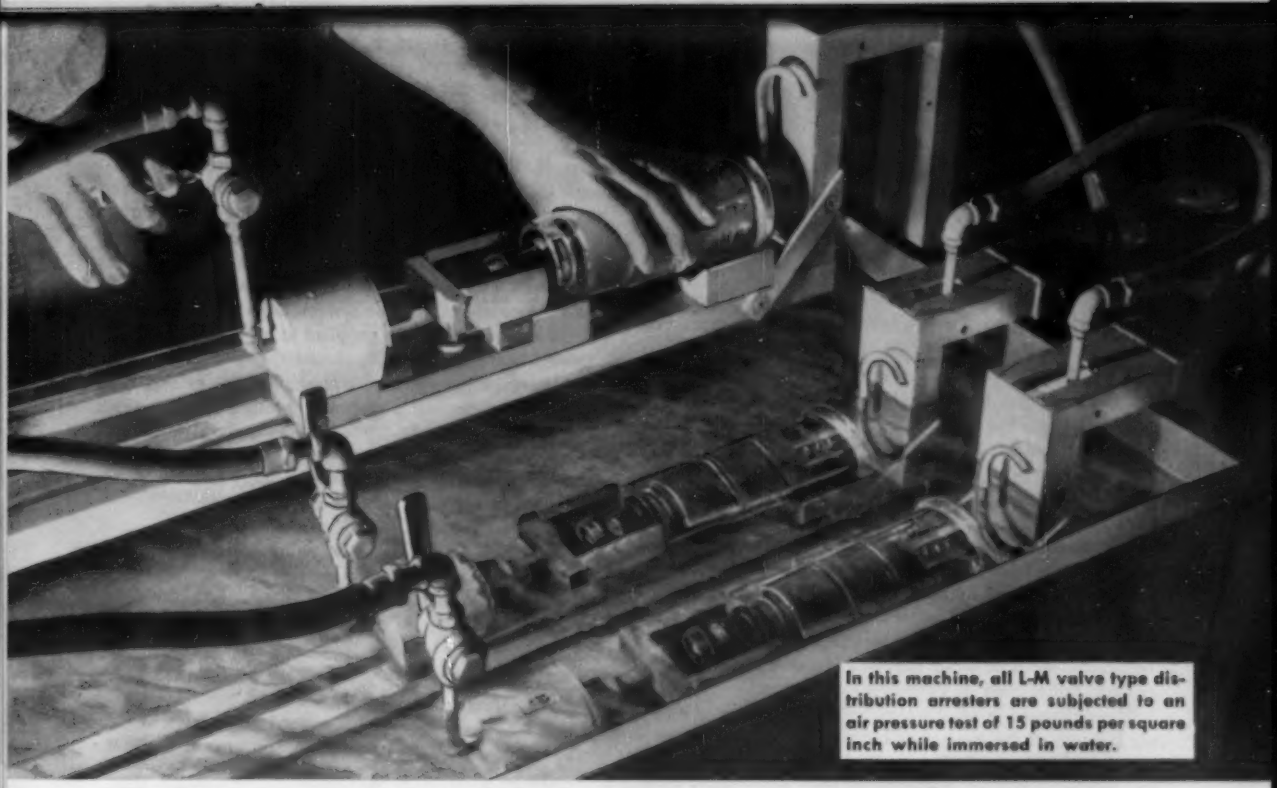
Ask For Complete Information

Ask the L-M Field Engineer for Bulletin LA2 on L-M's Valve Arrester, giving specific information on arrester requirements, design and performance; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL

228

Lightning Arresters



In this machine, all L-M valve type distribution arresters are subjected to an air pressure test of 15 pounds per square inch while immersed in water.

How L-M's Type E Valve Arresters Are Pressure-Tested For Positive Sealing

By **M. L. FENNIG**
Application Engineer
Protective Equipment
Line Material Company

All of L-M's valve type distribution arresters are pressure-tested to assure a positive seal against moisture. After the arrester is assembled, except for glass cap and wire lead, air under 15 pounds pressure is applied through a small V-cut in the copper cap. While under pressure, the arrester is held under water to see whether any bubbles appear, indicating air leaks. Since the valve material is porous, this air pressure test checks the gaskets at both ends of the arrester. After the test, air pressure is released, the opening is solder-sealed, the lead and the glass cap are attached.

Heavy Seals At Each End

Top of the arrester is sealed by a heavy synthetic-rubber gasket between the copper cap and the seat on the housing. Pressure on the gasket is maintained permanently by spinning the copper cap over a flange on the glass housing, while the assembly is under pressure in a hydraulic press.

The bottom of the arrester is also sealed by a heavy synthetic-rubber gasket which is held in place against the glass seat and compressed by the Isolator assembly.

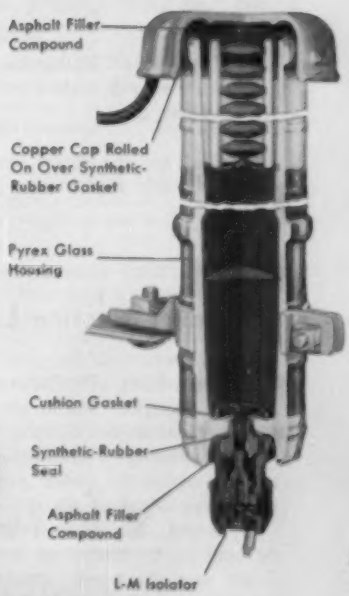
Visual Testing In Field

No electrical testing is required to determine the condition of L-M's Type E valve arrester, because it is in a *glass* housing. Visual inspection is the complete test! Should the spark gap be damaged by any cause, permanent telltale evidence can be readily seen through the Pyrex glass housing. In the rare cases when the valve element may be damaged by overvoltage or direct strokes, or the spark gap fails to extinguish power follow current, the Isolator will operate.

L-M's Isolator gives positive assurance against grounding feeders by disconnecting the ground lead from the arrester if the arrester should ever become damaged. It also provides the lineman with a visual indication of a damaged arrester.

Ask For Complete Information

Ask the L-M Field Engineer for Bulletin LA2 on L-M's Type E arrester, giving specific information on arrester requirements, design and performance; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



LINE MATERIAL
Lightning Arresters

READERS FORUM

Don't Kill Woodpecker, Make Him Sick

To the Editor:

I read with interest the article, "Utilities Ally Against Woodpeckers," in the June 20 issue.

I have great hopes for what might be learned from the three-year program that the four utilities have sponsored at Penn State University. Possibly a chemical can be found that will make a woodpecker sick, but not kill him. Such a chemical might be put right into the treating cylinder and forced into the pole along with the creosote or penta.

Results mentioned by Mr D. A. Campbell, Jr, on wrapping the poles with 19-gauge 2 × 2-mesh hardware cloth do not agree with our experience. For about five years we have used this treatment and find it over 90% effective.

For example, a recently completed pole-by-pole inspection of 52 miles of 115-kv line, made before adding a shield wire, showed that woodpeckers had made five holes in the mesh. This and other recent inspections have revealed that the mesh was not close enough to the ground. Therefore, we now wrap the mesh to within 6 ft of the ground, rather than of the former 12 ft limit.

The difference in results may be a reflection on the tensile strength of the mesh. We have found that the strength varies between manufacturers. Within the last year or two, one company has introduced a tougher mesh made from 70,000-psi steel.

I have also found that if the mesh is not stretched tight, the woodpecker can more easily grasp the wire in his beak and twist it until it breaks. We have overlapped the joints 2 in. and use 1½-in. staples.

And as for the article entitled Metal Ribbons Might Scare Pileated Pecker (EW, July 11, p 129), can you imagine what might happen to the streamers in a windstorm.

W. L. Rush
Transmission & Distribution Engineer
Louisiana Power & Light Co
New Orleans, La.

• Mr Rush and the editors hope that other engineers will contribute their experiences. All helpful comments will be published.

Resistance Heating Load Not Profitable

To the Editor:

Frank R. Innes, in his letter to the editor in the June 27 issue of Electrical World, severely criticizes Constantine Bary's recent article "Cooling Load Needs Complement." While ostensibly a criticism of this article, the letter actually indicts the power companies for their negligence in building up the electric house heating load.

Apparently Mr. Innes believes that this load should be built up by promoting the use of resistance heating. I am sure the power companies would do everything possible to develop this load even at a temporary loss, if they could be convinced that ultimately it would be profitable.

Gas heating is now considered so satisfactory by most people that it does not need much improvement. However, the need for a system with lower operating costs is quite real. Nevertheless, if a system of resistance heating with operating costs slightly higher than those of gas heating should be developed, the power companies undoubtedly would vigorously exploit the system, unless it was apparent that the load could not be supplied at a profit even after a lengthy trial period.

Mr. Bary has clearly shown the difficulties of supplying large air conditioning and house heating loads without incurring a loss. If Mr. Innes could supply a description of a new house heating system which has some possibilities of becoming satisfactory to both the users and the power companies, it would be greatly appreciated.

J. K. Ostrander
Consulting Electrical Engineer
United Engineers & Constructors Inc.,
1401 Arch St
Philadelphia, Pa.

• If electric is superior to combustion heating for homes —and it certainly is—then the power companies have a superior service to sell. And if instead of saying that electricity can't compete with other fuels on a cost basis, the power companies would get out and sell house heating on its merits and at a price to earn a return on the service then they would truly be proponents of complete electrical living—Frank R. Innes.

NRECA Not Biggest Lobbyist

To the Editor:

It is our understanding your publication reported (June 13, p 63) National Rural Electric Cooperative Association's expenditures for the first quarter of 1955 as $67,073.64. This is an erroneous figure as is explained in the accompanying copy of a letter which has been sent to the Clerk of the House of Representatives and the Secretary of the Senate.

"In filing its First Quarterly Report under the Federal Lobbying Act, National Rural Electric Cooperative Association made an error in its computations.

"In D(1) of Page 2 of the report, the sum of $67,073.64 was inserted. Actually, this was the total amount of our members' dues that exceed $500. As you know, we are also required to report such in a different part of the report. In some manner of making out the report, this figure was inserted when the true figure that should have been inserted in D(1) was $26,183.03.

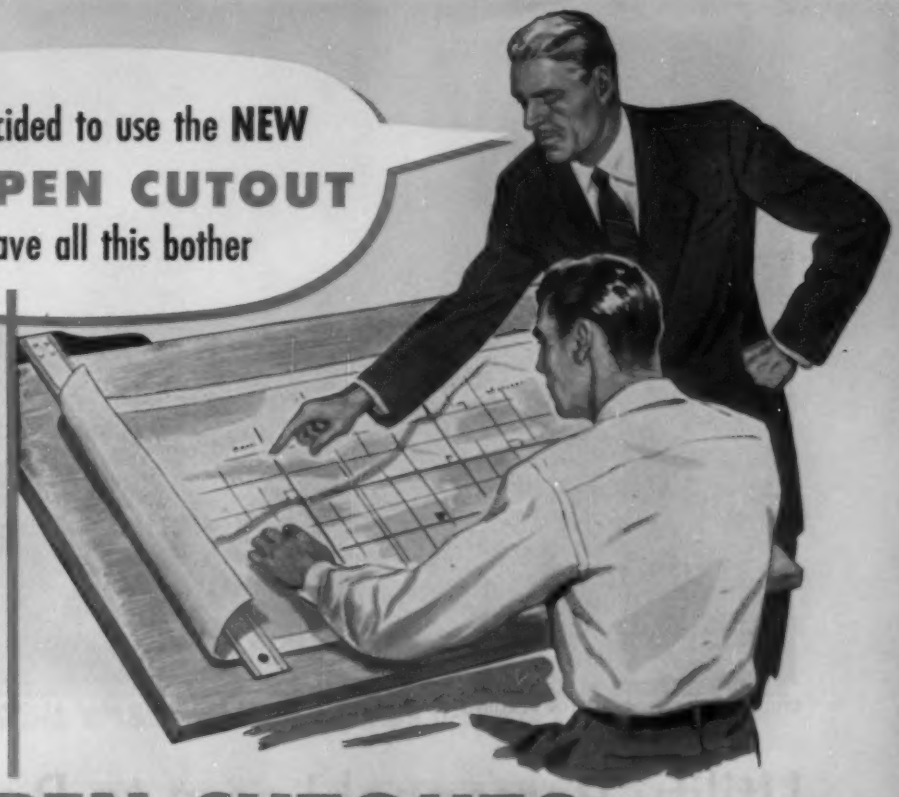
Charles J. Fain
Assistant General Manager
National Rural Electric Cooperative Association
1303 New Hampshire Ave, N. W.
Washington 6, D. C.

• The first reported figure made NRECA the biggest lobby spender for the first three months of 1955. The new figure drops the association to sixth place.

We've decided to use the **NEW**

S&C OPEN CUTOUT

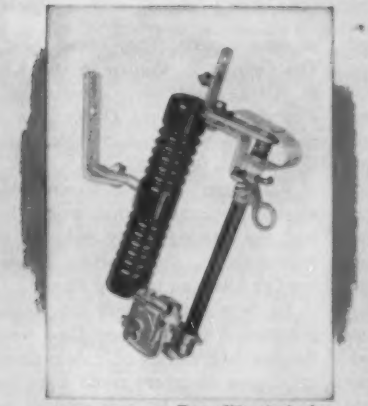
and save all this bother



Don't waste time on a detailed short circuit analysis—deciding just where heavy duty cutouts are needed. The NEW S&C Type XS can be used wherever you need an open cutout.

S&C OPEN CUTOUTS CAN BE USED

FOR BOTH "HEAVY DUTY" AND "STANDARD DUTY" APPLICATIONS



Type XS, single-shot style, birdproof insulator. Also available in three-shot style, and with NEMA insulators.

. . . they give heavy duty protection, but meet standard duty cutout budgets

The increased interrupting capacity of the S&C Type XS eliminates the problem of deciding where heavy duty cutouts will be needed . . . an S&C Type XS can be used in every case . . . for it has an interrupting capacity of 5,000 amperes (7.5 kv rating), and 4,000 amperes (15 kv rating).

It is no longer necessary to carry warehouse and service truck stocks of both standard and heavy duty cutouts. Nor do you have to worry about construction crews installing the wrong cutout at a particular protection point.

All these advantages become economically justifiable because, for the Type XS Cutout, S&C has developed a recoil mechanism that makes it unnecessary to resort to conventional means of increasing cutout interrupting capacity—namely, heavier construction, large bores, and double venting—which not only increase cutout costs but usually sacrifice performance, especially on low fault currents.

Information about the Type XS Cutout is contained in the new S&C Catalog Section 511 . . . we will gladly send one at your request.

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS, U. S. A.

IN CANADA:
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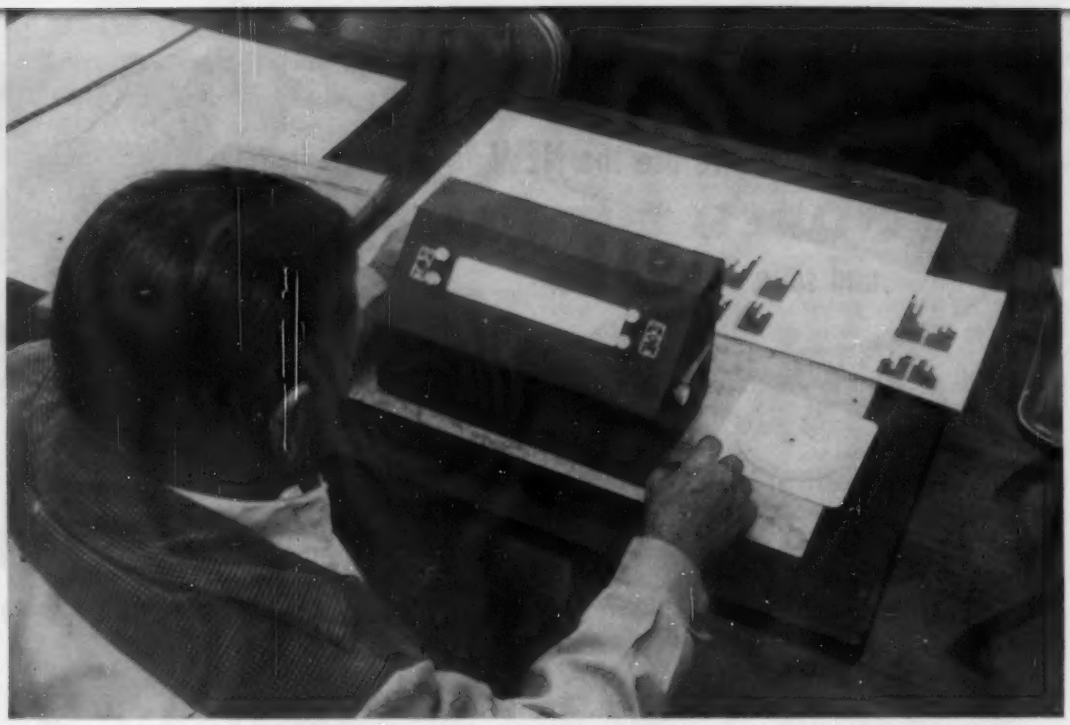
POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METAL-CLAD SWITCHGEAR

Specialists in High-Voltage Circuit Interruption



STUDENT HERE WORKS WITH READING TRAINER WHICH FORCES PERSON TO READ AT CONTROLLED RATE OF SPEED

Utility Personnel Learn to Read Faster

MANAGEMENT
Industrial Relations

Public Service of Colorado finds its reading training course a highly successful method of cutting executives' reading time

Reading time for this article should be 1½ minutes for PS of Colorado personnel, and 4¼ minutes for those not trained in rapid reading.

Most modern business executives contend that one of their biggest problems is keeping up with the large volume of printed matter that crosses their desks. In addition to business correspondence, reports, and other printed matter concerned with the business, there is the large volume of news which the executive must read to keep abreast of developments in his field. Thus, reading becomes a pressing problem.

Various techniques have evolved to cope with this situation. Many companies digest the news for their personnel. Some executives place the burden of reading on an assistant who culls out the highlights. And then, there is the technique of speeding up the reader. This is the course adopted by Public Service Co of Colorado.

H. A. Tiemann, educational director, and E. P. Mills, assistant director, education department of Public Service, after preliminary investigation, decided that the best answer to the reading problem was to teach company personnel to read faster. They learned the startling fact that most adults read at the same rate, about 250 words per minute, that they achieved by the time they reached the seventh grade. Tiemann and Mills also learned that big strides had been made in developing techniques for speeding up reading rates and that these techniques were being carried into industry where they could really pay off in time saved.

First, they themselves enrolled in a course at Community College of the University of Denver. On the basis of their experience they recommended that the personnel of the company be given similar training. Management approved the idea, and the education department was given the task.

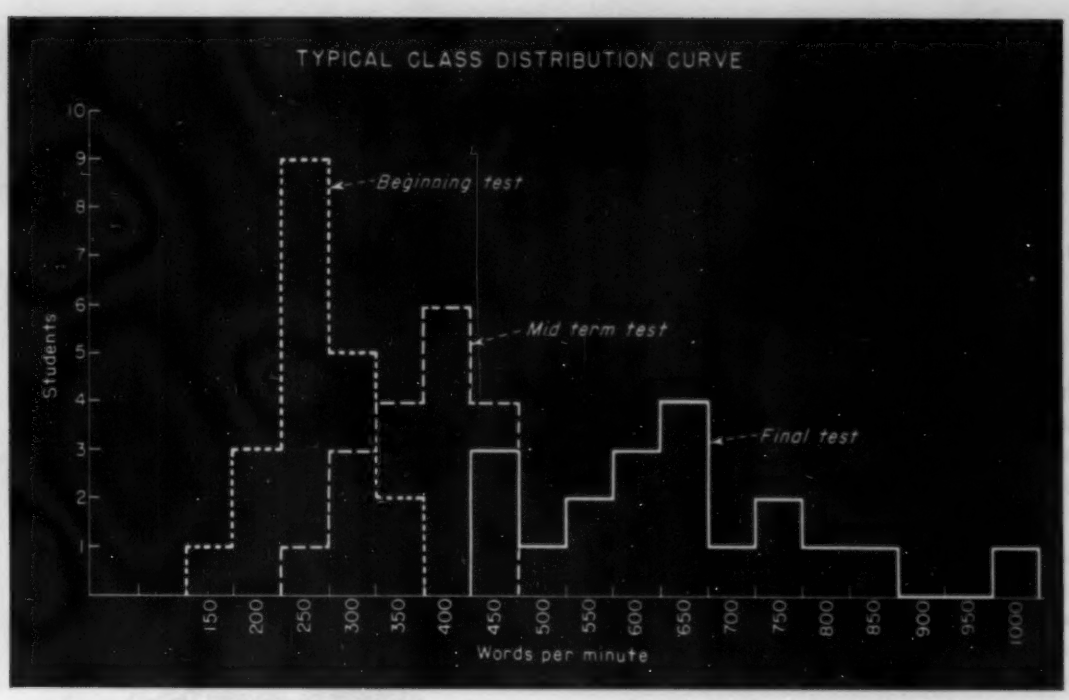
Tiemann and Mills decided to call in some experts. They found these in Drs George T. Vardaman and Keith E. Case, heads of Communication Foundation, Ltd, of Denver, an organization with considerable experience in this field.

Vardaman and Case recommended several implements that would help with the training. They included: one tachistoscope, ten reading trainers, reading kits, and training films.

To help further with the training program, Vardaman and Case taught the first two classes of Public Service employees so others could learn how to carry on the training without professional assistance.

In selecting the first class to receive training, it was decided that the logical students would be executives and sub-executives because as a rule, they were the men with the most reading to do.

A training course is about 20 hours, scattered in two-hour sessions held in company rooms after hours. No spe-



RESULTS OF TRAINING COURSE AFTER 20 HOURS SHOWS LOWEST STUDENTS MORE THAN DOUBLED READING SPEED

cial permanent space is necessary.

As for the results, here is an extract from the company's report:

"Some significant results were obtained by this training. In evaluating the speed and comprehension results obtained, certain factors should be kept in mind. This type of training is designed to raise the "reading ceiling" —ie to increase the maximum rate of comprehension. Basically you must learn to read faster simply by making yourself read at an ever increasing rate. Obviously, this cannot be done with a disregard for comprehension. But it has been learned also that insistance on a high degree of comprehension during this training lowers the potential ceiling to possibly 500 words per minute (with a tested comprehension in the nineties).

If, on the other hand, students can be induced to "cut loose," they may find that they can attain much higher speeds—say 1,500 w/m or more—and still pass comprehension tests in the sixties. Then, when they read material that they should digest more thoroughly, they can easily do so by reducing their speed by one-third. The result will be 1,000 w/m and a high degree of comprehension.

"The average beginning reading speed was 264 w/m with a tested comprehension at 68%. At the conclusion of 20 hours of instruction, the average speed had increased over 2½ times to 696 w/m. This was accompanied by a reduction in comprehension of 3 percentage points or a final comprehension of 65%.

"It should be noted that everyone at least doubled his original reading speed. The greatest increase was over five times the original speed of the individual."

Aside from the obvious benefit of saving time, learning to read faster has other benefits that merit consideration.

1. Slow, laborious reading habits tend to obscure the main thought of any article. Rapid reading not only makes clear the central ideas but also orientates the supporting points.

2. The skillful reader will employ a varied reading attack. Reading speed and technique must be suitable to the article being read and needs of reader for information contained in it.

3. One cannot read rapidly without having excellent powers of concentration. The training increases concentration to high levels.

Mills, commenting on future possibilities of reading training, says:

"The era in which the public utilities find themselves today demands the most enlightened judgment possible on the part of its management team. How can this be brought about? Surely the more widely read, the broader the background they will have on which to predicate the delicate decisions of the day."

The following are the details of the equipment and materials Public Service purchased to handle training classes of 20 men;

Tachistoscope — This is essentially a slide projection machine with a shutter flashing device. It is used to increase eye span and decrease reaction time.

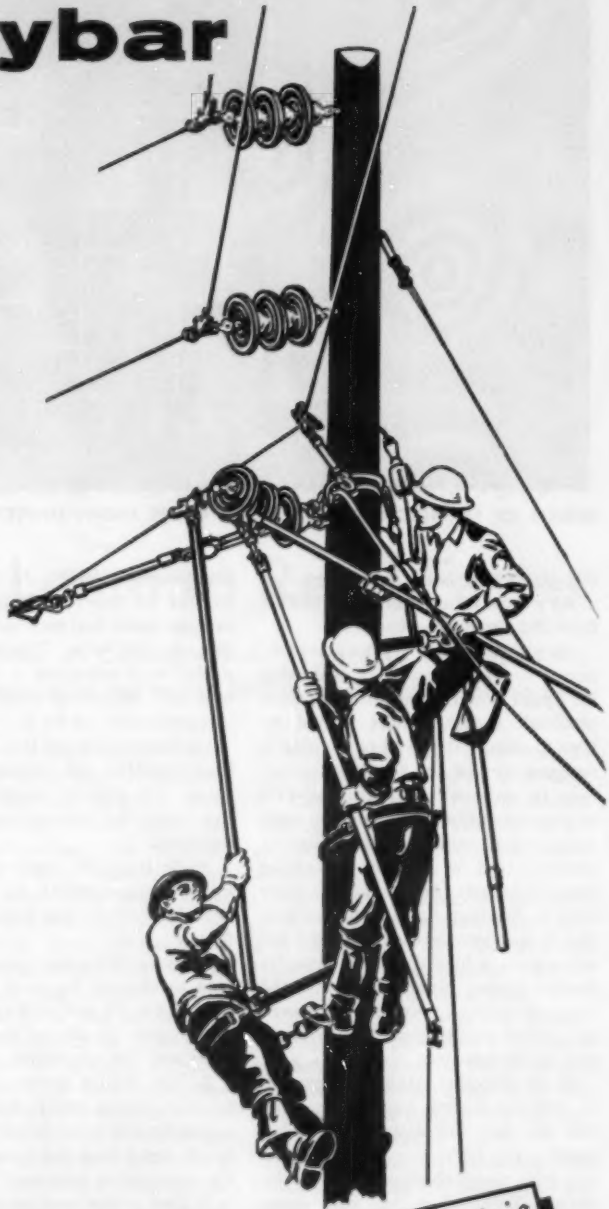
Reading Trainer—This is a device that forces a person to read at a controlled rate of speed. The rate can be varied as training progresses. Number of machines required depends on size of classes and how instruction is handled.

Reading Kits — With trainers, a reading kit is needed. Each student must have one. The kit contains many reading exercises and comprehension tests, and gives better control.

Training Films — Also used are training films, purchased in the case of Public Service from Iowa University. They contain reading matter graduated in reading speed from 270 w/m to about 450 w/m.

HOT-LINE TOOLS and SAFETY ACCESSORIES

...via Graybar



Chance hot-line tools are products your linemen respect and use with confidence. There's a specialized Chance tool designed to do every hot-line job safely and efficiently.

Graybar can supply Chance hot-line maintenance tools individually or in sets. Incorporating the latest developments in equipment for handling energized lines, Chance tools are tested to withstand 75,000 volts per foot. Metal fittings are made of lightweight, heat-treated aluminum alloy . . . poles are laminated Sitka Spruce.

In safety accessories, Graybar distributes Salisbury protective devices of all types—rubber line hose and insulator hoods . . . rubber blankets and jackets . . . rubber coats, gloves and sleeves. All are top-quality, fully-guaranteed products made of the purest crude rubber.

Call Graybar for all of your other pole-line needs as well. You can rely on your local Graybar Representative to provide complete, accurate information on anything you require. For special help on out-of-the-ordinary problems, feel free to ask for the assistance of your nearby Graybar Outside Construction Specialist. Graybar Electric Company, Inc., Executive Offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.

538-98

Call Graybar first for... Graybar Everything Electrical

IN OVER 120 PRINCIPAL CITIES

BETWEEN SESSIONS REGISTRANTS CLUSTER ABOUT DISPLAY TABLE TO SCRUTINIZE EQUIPMENT AND ITS LITERATURE

PCEA Delegates Hear How . . .

Sage Advice Wins Industrial Loads

Open the door to increased power sales by selecting and recommending to industrial customers the proper electrical equipment for the process. Following this theme, representatives of electrical heating equipment manufacturers paraded their wares before 200 registrants and told of recent applications during an industrial heating conference presented by Pacific Coast Electrical Association in Los Angeles, June 22-23. Cooperating with PCEA were three national engineering societies—AIEE, ASME and AWS—and the Electrical Maintenance Engineers Association of Los Angeles.

Leading off the parade were presentations of heating with infrared and far-infrared equipment. High-temperature infrared (2,500K) produces a more nearly uniform temperature in a 0.25-in. thickness of enamel over a black metal base than does a lower temperature source, even with the same watts per sq in. heat density, said George L. Larson, Sprayking, Inc. Low-temperature infrared is most efficient for drying glass products and skins, in food processing, and wherever thermo-mechanical shock may be a factor.

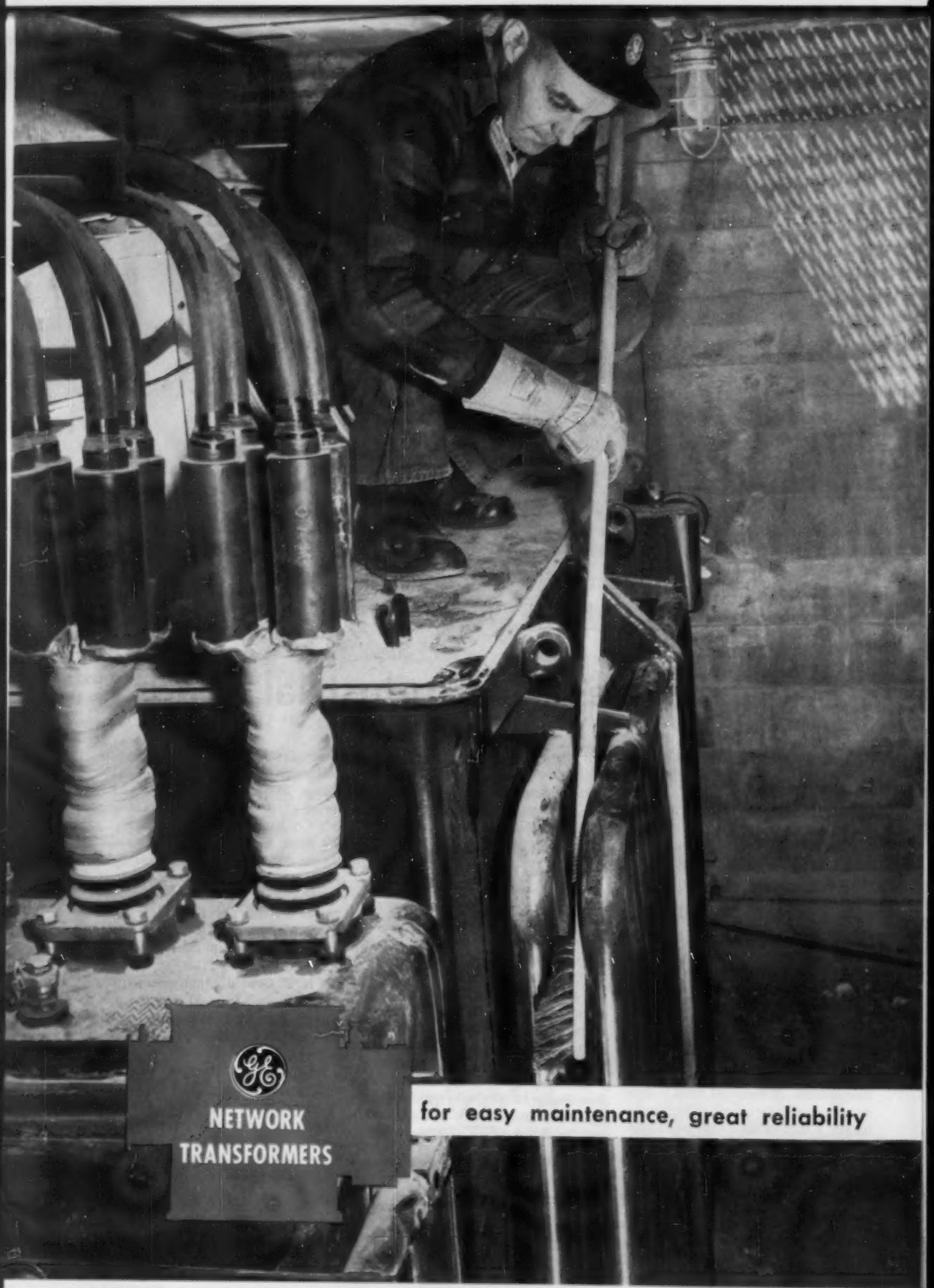
Infrared Aids Dehydration . . . Water's ability to absorb far-infrared energy makes this type of heat desirable for dehydration processes, said A. M. Tompkins, Montgomery Bros, representing Edwin L. Wiegand Co. In one job, far-infrared was trained on V-belt pulleys in pre-heat, baking, and curing ovens, with selective switching of pairs of heaters to maintain the proper temperature during manufacture. Other applications include the dehydrating of braiding material for shoe laces, heating of graphite coatings on the inside of TV picture tubes, and the shrink-fitting of engine parts.

Heat Cables Foil Frost . . . Mineral-insulated, copper-sheathed heating cable buried in the ground prevents frostheaving of the foundation of cold-storage and frozen-food plants, reported C. A. Seville, Nelson Electric Mfg Co. Such cable has been used:

- Along the track to keep airport hangar doors from icing during cold weather.
- In the air conditioning duct system of a North Carolina textile plant to provide 550 kw of comfort heating during winter when the temperaure sinks below zero. This application, said H. E. Oswald, Montgomery Bros, saved the plant $10,000 over the cost of equivalent steam-generating equipment and should result in a lower operating cost.

Production of high-quality chemical fertilizer is maintained through use of electric heat. Strip heaters eliminate deposits of chemicals in a pipeline from an outside storage tank; tubular heaters on spray mixing nozzles pre-

(*Continued on page* 30)



for easy maintenance, great reliability

NEW WING RADIATORS

make G-E network transformers easy to clean and paint . . . and give extra reliability

The new "wing" radiators make it easy for you to clean and paint G-E network transformers because you have extra room to reach tubes and tank. The new radiators, featuring box-brace headers, increase reliability because they reduce the possibility of leaks and give added structural strength.

EASY TO CLEAN AND REPAINT

You can easily clean the tubes by pushing a long-handled brush between the banks of radiator tubes, either from the top or from the ends of the transformer. Periodic cleaning is the best defense against corrosive accumulations of water, sewage, dirt, and chemicals (such as salt used for snow removal).

It's also easy to repaint transformers with the new wing radiators either by the flow method or by brushing—just use a long-handled nozzle or brush in the same way you use the cleaning brush.

INCREASED RELIABILITY

By using headers to carry the circulating oil or Pyranol* from the tubes into the tank, the number of entrances to the tank is greatly reduced. On the new 500-kva network transformer, for example, there are only 16 entrances into the tank instead of 56 on the previous design. This greatly reduces the chance for leaks.

SIMPLIFIED MAINTENANCE

The tank cover and switch are welded to the tank, thereby eliminating large gasketed areas and further reducing the possibility of leaks.

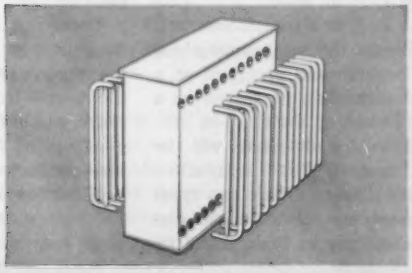
The new wing design also reduces the chance for corrosion to start. Radiating surfaces are vertical, not horizontal, and corrosive elements—water, sewage, etc.—do not readily collect on the radiators.

Maintenance is simplified in other ways. You can remove bushings, for example, from the outside of the tank. There are no large gaskets to replace. Accessories are located on the high-voltage end of the transformer where you can reach them easily. It's a simple matter to inspect the network protector because it slides out on rails.

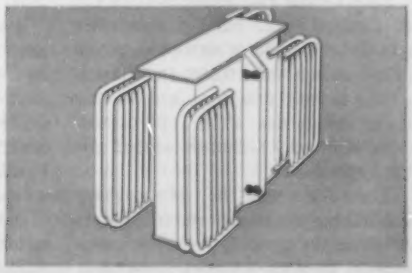
HELP FOR YOU

For help in solving your network problems and for complete information on the advantages of G-E network transformers with wing radiators, see your local G-E sales representative. General Electric Company, Schenectady 5, New York. 4154

*Reg. Trade-mark of General Electric Co.



CONVENTIONAL-DESIGN RADIATORS have many tank entrances (blue circles). Horizontal surfaces collect dirt—maintenance is difficult.



NEW "WING" RADIATOR with box-brace headers has few entrances into tank and gives great structural strength, and is easy to clean.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Good Advice Wins Load

(*Continued from page 27*)

vent clogging; and, heaters on line-feeding pumps ease the pumping load. This application was reviewed by C. K. Massey, Westinghouse Electric Corp. Scale formation or deposit of constituents of the liquid being heated on electric sheath heaters may be prevented by keeping the sheath in the liquid, by use of corrosion-resistant sheath, and by selecting the proper watts per sq in. heat density, said B. W. Depew, Heating Engineering & Supply Co.

Rejects Drop Sharply . . . Vacuum heat-treating of metal parts so cut the rejection rate for one customer that the equipment paid for itself in ten months, reported E. C. Buckingham, Pacific Scientific Co. But, he cautioned that the type of process should be the determining factor in recommending vacuum heat treating because of the relative high cost of this gear.

Electric furnace brazing with an atmosphere of pure, dry hydrogen permits the joining of parts with complex, irregular surfaces and produces a clean finish on the product. Continuing this discussion, Ray Bryant, General Electric Co, said standard and stainless steels, cast iron, copper, a few aluminum alloys, silver, and some magnesium alloys can be furnace-brazed.

Emphasis was placed on resistance heating of metals by Leigh N. Call, Call Equipment Co. Resistance heating reduces formation of scale and is more efficient than fuel-fired furnaces, and has a lower initial cost than induction heating equipment.

The food industry offers a great potential for the use of dielectric heating for sterilization, commented A. N. Swenson, Peeco Corp. More use could be made of dielectric heating in sealing plastic packages, he said.

Pf Correction "Must" . . . Power factor correction for low-frequency induction heating ovens is a "must," reported Lombard Smith, Lombard Smith Co, because of the 50-54% lagging operating range. Installation of 10-kc induction heating equipment for continuous welding of pipe was described by Harlan A. Messner, Tocco Division, Ohio Crankshaft Co.

Non-ferrous melting with line-frequency induction furnaces offers such advantages as high metal recoveries, almost-perfect temperature control, and reduced maintenance and down time, according to A. W. Nash, Ajax Electric Co. But higher first cost (about $125 per kw) higher operating cost, and hot charging must be considered before recommending the installation.

Salt bath brazing, said Nash, finds use principally in heat treating of steel and aluminum, and in carburizing, brazing, annealing, martempering, and austempering operations. Average consumption is 10-40 kwhr per hr. Salt bath brazing avoids initial thermal shock, is faster than an air furnace, permits flexibility in heating, and allows exceedingly close temperature control.

Induction Galvanizing . . . Induction galvanizing for continuous steel strip operations and for aluminizing strips has extremely high capacity for a given size, produces a very high quality in the finished product and has very low maintenance costs. Higher first cost and need for continuous operation, Nash reported, are two main disadvantages.

High-Altitude Transmission Test Planned

First high-altitude testing of an ultra-high voltage transmission line is being planned for a craggy peak in the Colorado Rockies. The results of the test are expected to be of world-wide significance.

Starting this fall, Public Service Co of Colorado will build a substation and about a mile of three-phase line at an altitude of 10,300 ft. Participating in this test are six manufacturing companies which will furnish equipment and materials needed for the experiment.

The test will be of primary importance because there is no data available on ultra-high voltage transmission at high altitudes. The only previous high-altitude test was made in the French Alps at a 6,000-ft elevation.

In addition to providing basic information, the Colorado test will enable Public Service to design better transmission systems carrying large blocks of power over lines that will be strung to 12,000-ft elevation. The experimental line will have 330-kv conductors to allow comparison of test data with that of similar lines tested by American Gas & Electric Co at Tidd Station, Brilliant, Ohio (EW, July 3, 1950, p 76).

Because only one transformer will be available for the test, a three-phase line will be built and energized as a single unit. The first phase will be a single conductor of about 1.4-in. diameter. The second phase will be bundled, two 0.92-in. conductors spaced 18 in. apart. These two types of conductors are of the same diameter and spacing as those tested by AG&E.

The third phase also will be bundled, two 1.25-in. conductors spaced 16 in. apart. This type of conductor holds particular interest for Public Service because it is believed to be the most practical and most feasible.

Instruments mounted on the transformer and in the substation will measure corona losses, voltage, and amperage. Radio interference will be measured along the route of the line. Because of the hazard of the ultra-high voltage, these instruments will be read by telescope from a nearby building.

These manufacturers, providing equipment as listed, will take part in the experiment: Westinghouse Electric Corp—transformer, lightning arrester, and instruments; Ohio Brass Co—insulators; Aluminum Co of America—conductor; American Bridge Co—102-ft tower; Hughes Bros—timber and fittings; and Malleable Iron Co—wood spars and hardware.

Fame of the project already has spread, stated L. M. Robertson, chief electrical engineer for Public Service and co-ordinator for the utility's part of the test. Interest in the test results has been expressed by a London concern which is looking ahead to building lines across the equator in Niarobi, Africa.

STEAM PLANT OPERATORS WERE INSTRUCTED BY THEIR OWN SUPERVISORS IN TWO-HOUR CLASSES HELD WEEKLY

Classes Prepare Operators for Job

MANAGEMENT
Industrial Relations

Rockland L&P instructs personnel to operate new Lovett Plant No. 3 Unit. Trouble-free startup makes the training worthwhile

DONALD S. BAILEY, Chief Engineer, Lovett Plant, Rockland Light & Power Co, Tompkins Cove, N. Y.

Rockland Light & Power Co believes that the smooth startup of its Lovett Plant No. 3 Unit was due in large measure to the training of plant personal through a company-conducted course in steam plant operation. Complete operation of the unit, now in service several months, has been taken over by the trainees.

Because of the highly specialized type of work, enough experienced men capable of taking over and operating a modern steam plant were difficult to obtain in one small suburban community. The alternative was recruiting the best available help and training these men to perform as plant operators. Once trained, such operators would accept standards set up by plant officials who would not have to put up with the often familiar objection, "At the old plant we did this."

Selection of new employees to train was based primarily on the men's desire to work in a steam plant and on work histories indicating reliability and general aptitude for handling machinery.

The need for training men with and without plant experience for the operation of Unit No. 3 was realized by Rockland at the unit's inception.

Operators of Units 1 and 2, with two years of additional experience by the time No. 3 would go into operation, would be the nucleus of reasonably experienced men around whom the company could build the operating shifts. To give experienced personnel a descriptive background of Unit 3 and new men a better picture of power plant equipment and its operation, Rockland undertook to conduct an operators training course. The company felt more would be gained by conducting its own school than by engaging an outside organization.

The student-operators, the company believed, would feel

SYNCHRONIZING PANEL was set up where operator-trainees could practice synchronizing the ac generator with system

more at ease and would enter into discussions more freely with their own supervisors.

Class instructors were from Rockland's own organization. Regular lectures were supplemented by special lecturers given by experts. Central Hudson Gas & Electric Corp supplied instruction manuals that had been developed for operation of No. 1 Unit at its Danskammer Point steam plant. This unit is basically the same as Rockland's No. 3 Unit. This material was the foundation on which the company built its own manuals.

Two classes of two hours each were held weekly, the last class just preceding the placing of the new unit in operation. Material presented during each class was limited to allow a discussion period for answering questions and adding any necessary explanations.

Mimeographed copies of material from the manual on a particular subject were distributed to each operator at the class devoted to that subject. The accumulation of these gave each operator a complete manual at the end of the course, when suitable permanent covers were furnished. The manuals remain in the possession of the operators.

Training aids included a small dynamotor and synchronizing panel set up where operators could practice important functions of synchronizing an ac generator with the system. A selector valve and control device were also set up to familiarize operators with Miniline control in both automatic and manual position with direct observation of the control drive movement. Blackboard talks helped create interest in the explanations of the functioning and location of pieces of equipment.

The following subjects and lessons comprised the course:

1. Combustion, physical problems of combustion, smoke and fly ash, pressure and temperature.

2. Boiler, pulverizers and burners, determination of boiler efficiency.

3. Fundamentals of steam turbines, condensers, feedwater heating.

4. Reheat boilers.

5. Fundamentals of electric generator.

6 and 7. The steam generator. coal scales, mill feeders, mills, exhausters, control, water and steam flow, air and gas flow, furnace, superheater, reheater, economizer, boiler steam drum internals, coal burners, oil burners, burner tilt and control, ignition torches and control, air heater, dust collector, induced and forced-draft fans, safety valves, hydraulic coupling and control, soot blowers, and reheat piping.

8 and 9. Turbine generator, including description, lubrication, oil purifying system, turbine governors, accessories, generator hydrogen cooling.

10 and 11. Condenser and auxiliaries, circulating water system, chlorinating equipment, steam jet air ejectors, priming air ejectors, and piping arrangement.

12. Feedwater heating, open heaters, closed heaters, and description of heaters 1 through 6.

13. Pumps: piston, centrifugal, rotary, chemical feed, recirculating, boiler feed, hotwell, and fuel oil.

14. Boiler water cycle, condensate piping, boiler feed piping, bleed steam system, bleed steam control, high-pressure heater drains, boiler feed, and condensate system drains.

15. Water supply and treatment, boiler water treatment, hardness of water, evaporator system, and sodium zeolite softeners.

16. Miscellaneous water systems, bearing cooling water, city water, gland seal water, service water, and ash sluice and screen water systems.

17 and 18. Compressed air system, control air, service air, soot blowing air, compressors, operation of compressors, and air coolers.

19 through 21. Instruments and controls, general outline of boiler controls, combustion control system, condensate flow control.

22 through 25. Plant electrical layout and equipment, 2,400-v auxiliary bus, 440-v auxiliary bus, and relays and interlocks.

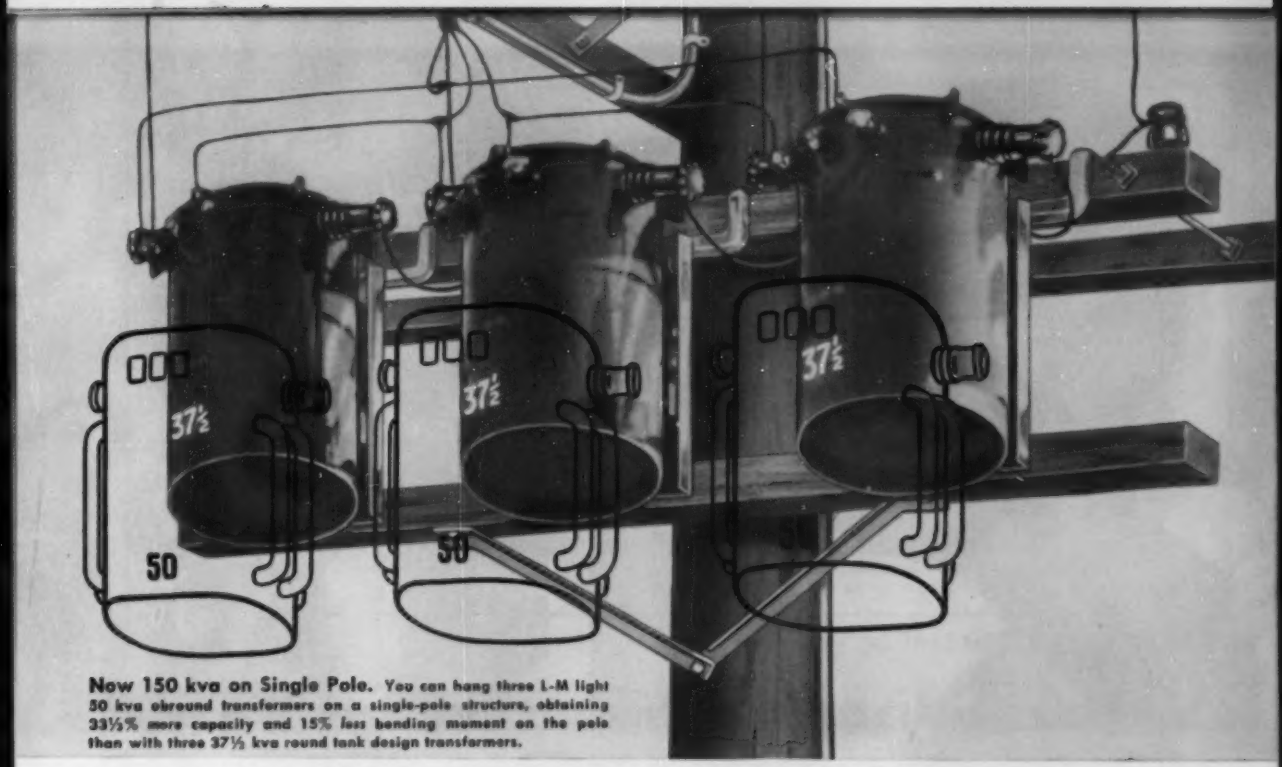
26. No. 6 fuel oil system.

27. System operation and relationship of plant to system.

28 through 30. Plant startup procedure, boiler startup, turbine startup and operation of controls, and soot blower operation and procedure.

During the startup period of No. 3 Unit, engineers from Burns & Roe, Inc, consulting engineers for the plant addition; from Combustion Engineering-Superheater, Inc, from General Electric Co, and from Bailey Meter Co were present eight hours each day, but only in a consulting capacity. They maintained a 24-hr crew for the first three to four weeks of operation.

Approximately 1,475 man-hours were spent in the classroom by an average group of 30 men.



Now 150 kva on Single Pole. You can hang three L-M light 50 kva obround transformers on a single-pole structure, obtaining 33⅓% more capacity and 15% *less* bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By **ALVIN B. COYLE**
Manager
Transformer Sales
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

219 AB

LINE MATERIAL Transformers

Leads of 48-inch 600-volt #12 wire furnished as standard equipment.

Bushing-Mounted Indicating Fuse with 48-inch lead can be supplied.

Solder-Sealed Bushings of strong one-piece wet-process porcelain provide a positive, lasting seal.

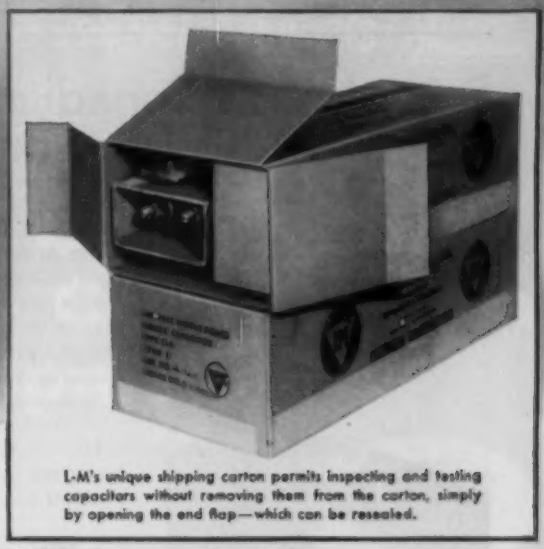
Pole-Mounting Bracket has two 9/16" holes for ½" lag screws. Standard EEI-NEMA crossarm-mounting bracket furnished if required. Capacitor can be mounted with bushings up or down.

Aluminum Metallizing process protects steel tank from oxidation; is followed by a chromate primer and a finish coat of alkyd resin paint.

Single-Pack, Round-Tank Design makes these capacitors small, light, easy to install. Unit has a one-minute discharge resistor; is completely impregnated under vacuum with low temperature Elemex liquid dielectric.

LM® LINE MATERIAL

Left: L-M's 5 kvar is 18⅝" high, weighs only 25 lbs. The 3 kvar is 13¾" high, weighs 18 lbs. These weights include the pole-mounting brackets. Standard EEI-NEMA crossarm-mounting bracket furnished if desired.



L-M's unique shipping carton permits inspecting and testing capacitors without removing them from the carton, simply by opening the end flap—which can be resealed.

Small, Light, Easy to Install . . .

L-M's New Secondary Capacitors Provide Needed Vars For Air-Conditioning Loads

Solder-sealed bushings, aluminum metallized finish on tank, and single-pack construction assure long life, low maintenance.

By **BLAINE SCHULTZ**
Section Engineer
Capacitors
Line Material Company

L-M's new secondary capacitor is your solution to the problem of poor voltage regulation and overloaded transformers caused by low-power-factor air-conditioning loads.

The unit is small, light, and rugged; easy to install on crossarm or direct pole mounting. It offers you outstanding design features, such as aluminum metallized tanks, solder-sealed bushings, one-minute discharge resistor, single-pack round-tank construction, and low-temperature Elemex liquid dielectric.

Protective Coating

L-M's unique aluminum metallizing process prevents oxidation of the steel tank and greatly extends the life of the capacitor. This process is followed by a chromate primer and a finish coat of alkyd resin paint. The finish coat is dark in color to facilitate heat radiation and keep the capacitor at low operating temperatures.

Solder-Sealed Bushings

Strong solder-sealed bushings of one-piece wet-process porcelain provide a positive, lasting seal. By eliminating gaskets and clamps we eliminate leakage. Therefore the capacitor can be mounted with bushings up or down.

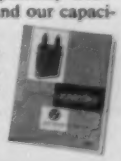
Pack Construction

The packs are assembled in air-conditioned rooms to assure uniformity and are tested with over-voltage to eliminate any actual or potential defects. The units have a one-minute discharge resistor to assure safe handling and storage.

L-M's new 240-volt, pole-mounted, secondary capacitors are available in 3 and 5 kvar. 48-inch leads are furnished and external bushing-mounted indicating fuses can be supplied when required.

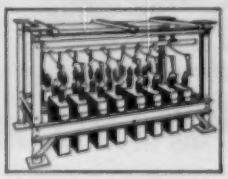
Ask us for complete information

Ask the L-M Field Engineer for complete information on construction and application of L-M's secondary pole-mounted and submersible capacitor equipments, 2400- to 13,800-volt equipments, and our capacitor bank engineering service. Or write Mr. Delaney at Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

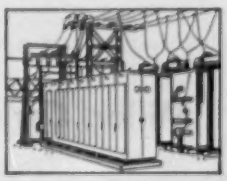


Other L-M Capacitor Equipments

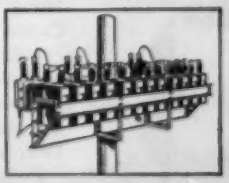
L-M offers a complete line of power capacitor equipments, such as these:



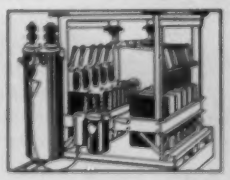
Factory-assembled blocks, which save time and money in building large banks.



Metal-enclosed capacitor equipments in all NEMA-standard sizes and ratings.



Factory-assembled racks for pole-mounted banks, both three-row and single-row styles.



VDS-Method factory-assembled block for multi-step bank switching—an exclusive L-M method that offers a substantial saving on switching equipment.

Also custom-designed protective and switching schemes.

Elemex® Capacitors

NEWS ABOUT PEOPLE

Page Heads Canadian Electrical Association

J. A. PAGE

J. A. Page, vice president and general manager of Southern Canada Power Co, has been elected president of the Canadian Electrical Association for the year 1955-56. Elected vice presidents for the same period were: A. C. Abbott, manager of the commercial and distribution department for the Shawinigan Water & Power Co; V. A. Ainsworth, general manager of Newfoundland Light & Power Co; and J. C. Dale, general manager of Canadian Utilities Ltd.

Page joined Southern Canada in 1918 and was the company's first apprentice. He first worked in the meter department and then was assigned to the transformer department. In 1919 he was transferred to the Drummondville powerhouse, becoming system operator in 1920.

Subsequently, Page worked in the company's accounting department and later served as manager of various SCP branches.

In 1948 he was appointed assistant general manager of Southern Canada Power and four years later was named general manager. Page was made vice president and director in 1953.

GE Makes Executive Change

George L. Irvine, commercial vice president of General Electric's southwestern region, has been appointed to a similar position as head of the company's ten-state midwest area with offices in Chicago. He succeeds Ross I. Parker, commercial vice president, who is retiring after 43 years with GE.

A native of Omaha, Neb., Irvine has been in Dallas, Tex., since he was elected a commercial vice president in May, 1953.

Irvine was graduated from Iowa State College in 1930 with a degree in electrical engineering and joined GE the same year as a student engineer on the company's test course in Schenectady.

After assignments in the apparatus, industrial, and commercial fields, he assumed charge of relations with GE apparatus dealers and agents. In 1941 he became manager of apparatus agency sales and, in 1949, manager of agency and distributor sales for the Apparatus Sales Division.

G. L. IRVINE

Miller, Carlen Elected VPs of Ryerson Steel

M. A. MILLER

Joseph T. Ryerson & Son, Inc, has elected Merle A. Miller vice president and treasurer, and Raymond N. Carlen vice president.

Miller joined Ryerson in 1922. He began in the credit department, rose to credit manager, and for some years directed credit activities at all the company's plants. He was elected assistant treasurer in 1945 and treasurer in 1946 holding that post until the present.

Carlen, who joined the company in 1946, became manager of inside sales in 1948. In 1953 he transferred to plant operations work and was made assistant operating superintendent the next year. He was appointed assistant to the vice president in charge of operations later the same year, and became assistant vice president in charge of all plant operations this past June.

R. N. CARLEN

Another reason why
UTILITIES EXPECT MORE FROM POWERS *American*

The Ultimate in Line Construction Equipment

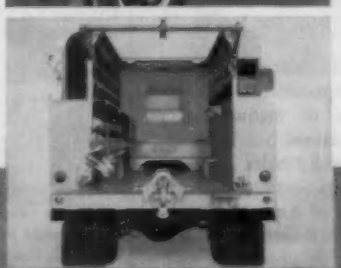
MANAGEMENT
likes the 800-C because it saves man-hours—furnishes crew comfort—provides a safe, durable, low-upkeep unit for heavy work.

SUPERVISORS
like the 800-C because it's a completely equipped body that's easy to load—easy to use—easy to inventory.

CREW MEMBERS
like the 800-C because it keeps tools and supplies in easy-to-find order. And, with a Pole-Master, it's a lineman's dream.

All shelves and parts bins are standard equipment. Street-side doors open 180° for easy access to all compartment space.

Sliding drawers are furnished in curb-side compartments. All door locks are keyed alike. Crew enclosure seats four.



56" wide cargo area provides space for miscellaneous supplies. The body can be equipped to meet individual needs.

Utility operators indicate that the 800-C is destined to set a new standard for line construction vehicles.

It furnishes the storage space—the crew facilities—and the equipment for handling the most rugged types of routine or emergency line work. And, when equipped with a *Pole-Master* fully-powered, live-boom derrick—as shown above—crews can set poles up to 75 ft. in length.

The Series 800-C in 11′, 12′3″, and 13′ lengths—and the Series 800 (without crew enclosure) in 11′ or 12′6″ lengths—can be furnished with *Pole-Master* or conventional derrick.

COMPLETE DETAILS and prices are yours for the asking.

Powers-American Division

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR STREET • BERKELEY 10, CALIF.

PERSONAL BRIEFS

Harllee Branch, Jr, president of Georgia Power Co, has been named by the Chamber of Commerce of the United States to membership on its 31-man policy committee.

J. A. Brouillard has been appointed assistant general superintendent of operations, Connecticut Power Co, with headquarters at Hartford. **H. J. Mosher** succeeds him as superintendent of operations in the company's northwest district in the Torrington area. **Robert F. Burnham,** formerly superintendent of distribution, Stamford Division, replaces Mosher in the central district serving the Middletown and Manchester areas. **Walter O. Prelle** succeeds Burnham in the post at Stamford.

Connecticut Light & Power Co has advanced **Anthony E. Wallace,** area development representative, to director of public information. CL&P has also announced the appointment of **George G. Hanel,** advertising manager, as manager, advertising and publicity department.

Glen C. Biegen, chief of the electrical and mechanical installation section at the Dalles Dam, has been named project engineer for the dam . . . **Louis B. Warren,** executive secretary of the Connecticut Public Utilities Commission has been appointed special counsel for the commission. **George J. Griffin** succeeds Warren as executive secretary.

Pacific Gas & Electric Co has appointed **John F. Bonner** assistant to **Walter Dreyer,** vice president and chief engineer . . . **Max A. Faucett,** professor of electrical engineering at the University of Illinois, who has been on a two-year leave of absence as consulting vice president of Illinois Power Co, has returned to active University duties.

Fred P. Nylander of Salida, Colo., has replaced **W. B. Petch** as commercial manager of the Cheyenne Light, Fuel & Power Co. Nylander has been associated with Public Service Co of Colorado for the past 14 years . . . **W. C. McWhinney,** vice president of Southern California Edison Co, recently retired after 44 years with the company. He was made vice president in 1951.

Stone & Webster Engineering Corp has appointed **William L. Sheets** a construction manager in the firm's Boston office. Sheets has been general superintendent of construction in the West coast area and has served as manager of S&W's Los Angeles office.

John Ager, manager, General Electric Co Atlanta office, has been named chairman of the Georgia Section of the American Institute of Electrical Engineers. **Tom Allen,** superintendent of transmission for Georgia Power Co was made vice chairman.

H. Gordon Smith, executive vice president of United States Rubber Co, has been elected vice chairman of the board and chairman of the executive committee. **Chester J. Noonan,** vice president, has also been elected a member of the executive committee. Another company appointment made **Herbert J. Reid** assistant general manager of the firm's Mechanical Goods Division with offices in New York. Reid was previously factory manager of the division's Fort Wayne, Ind., plant.

General Motors Corp's Electro-Motive Division has promoted **E. W. Kettering** from chief engineer to the new post of director of research. **B. B. Brownell** has been advanced from assistant chief engineer to succeed Kettering . . . **Oakley N. Dean** has been named manufacturing manager, Exide Industrial Division of Electric Storage Battery Co. Dean, manager of the division's manufacturing operations in Philadelphia since 1952, succeeds **Wallace E. Nyce** who has retired.

William Seymour, Jr, has retired as vice president in charge of operations for Joseph T. Ryerson & Son, Inc, and has accepted a position under United Nations Command as adviser to the Economic Coordinator for Korea.

Nelson Electric Manufacturing Co of Tulsa, Okla., has appointed **J. A. Dean** to the new post of manufacturing manager. **E. F. Hines** has been advanced from foundry sales manager to succeed Dean as foundry manager . . . New president of American Home Lighting Institute is **Robert W. Minett, Jr,** vice president in charge of merchandising for Thomas Industries, Inc.

Timed Selling

Inter-Industry Council ok's power use calendar to guide, time-gear farm promotions

A "Power Use Calendar" to guide and time-gear the industry's rural promotional activities in 1956 is being readied by the Inter-Industry Farm Electric Utilization Council.

Calendar was developed by a joint committee representing National Rural Electric Cooperative Association, Edison Electric Institute, National Electrical Manufacturers Association and Rural Electrification Administration. It is part of the council's efforts, through establishment of state-wide organizations, to step up use of electricity on the farm. Calendar will help utilities plus manufacturers, distributors and dealers of electric-powered farm equipment and appliances, to co-ordinate and time their advertising and promotional campaigns.

Other developments:

- Advisory membership on the council has been accepted by NRECA and NEMA. Other groups, says the council, are expected to announce acceptance of invitations to join in the near future.
- Council Chairman Fred H. Strong, deputy REA administrator, reports that coincident with 16 months of activity by the council, the number of rural electric borrowers whose margins are below the level considered necessary to insure financial soundness has been reduced from 252 to 179.

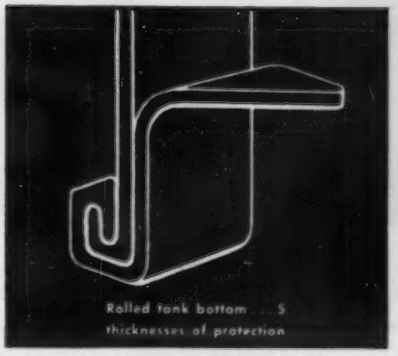
Bird Riddance Scheme Is Strictly for the Birds

Annoyed by the chatter and the litter of sparrows nesting in the eaves of their substation, Crowley (La.) workers of the Gulf States Utilities Co hit on a scheme to evict the winged nuisances once and for all.

Plastic bags, filled with moth balls, were hung in favorite nesting places. The harrassed employees felt that the fumes, if nothing else, would make the eaves less attractive for the birds. But the resourceful sparrows promptly tore up the bags, made nests of the shreds, and tried to hatch the moth balls.

H. H. Humphry, Distribution Transformer Product Engineer, points out this

FACT: New transformer design retains rolled bottom for maximum seal and strength



The exclusive rolled tank bottom design has been retained on the new Westinghouse pole-type distribution transformers. Five thicknesses of steel, coated with rubber-base cement and formed under pressure, are tapered to prevent water entrapment. This type of tank bottom construction is *still* unequaled for rigidity, strength and protection against corrosion and oil leakage.

More proof that you *can* get more for your transformer dollar.

• • •

For all the facts, call The Man With The Facts—your Westinghouse Sales Engineer. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70744

YOU CAN BE **SURE**...IF IT'S

Westinghouse

1894 Induction Watthour Meter

Commercial measurement of a-c energy made possible by O. B. Shallenberger's invention of the first induction watthour meter. Discovery hastened success of a-c systems.

ANOTHER WESTINGHOUSE FIRST . . .

New single-disc design brings single-phase performance to polyphase meters

Once again Westinghouse brings you a significant advance in the science of metering—a polyphase meter of a basic new design. It provides the same outstanding performance characteristics found in single-phase watthour meters. This means that you can apply polyphase meters with the assurance that they will handle all present and future loads.

To give reliable single-phase performance to its DSP and DAP polyphase watthour meters, Westinghouse adopted the single-phase electromagnet in a single-disc-type construction. The new polyphase design is smaller than previous similar types, contains fewer parts. Result: it's easier to handle, install and maintain.

Here are some additional noteworthy features:

Accuracy—by unique design, new meter utilizes a single-phase disc and electrically eliminates interference between elements.

Extended range—gives straight-line accuracy up to 667% of rating to handle present and future loads.

Ease of calibration—only three adjustments—light load, full load and phase balance—readily accessible at front of meter.

Built-in protection—co-ordinated materials minimize corrosion. Coil insulation raised to 10,000-volt impulse. De-ion® surge protection gaps discharge outside meter.

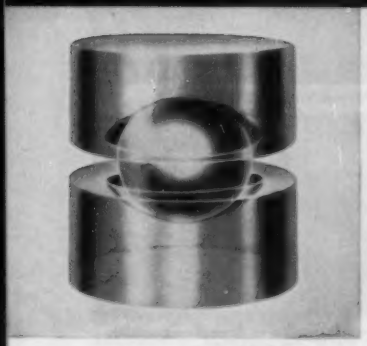
FOR MORE FACTS: Call The Man With The Facts... your Westinghouse sales engineer. Ask him for a copy of B-6398, or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

J-40483

YOU CAN BE **SURE**... IF IT'S

Westinghouse

METERING PROGRESS PIONEERED BY WESTINGHOUSE



1902 Ball and Jewel Bearing

Long-time accuracy was assured by stability of ball and jewel bearing assembly. This design has been proved by millions of meters in service.

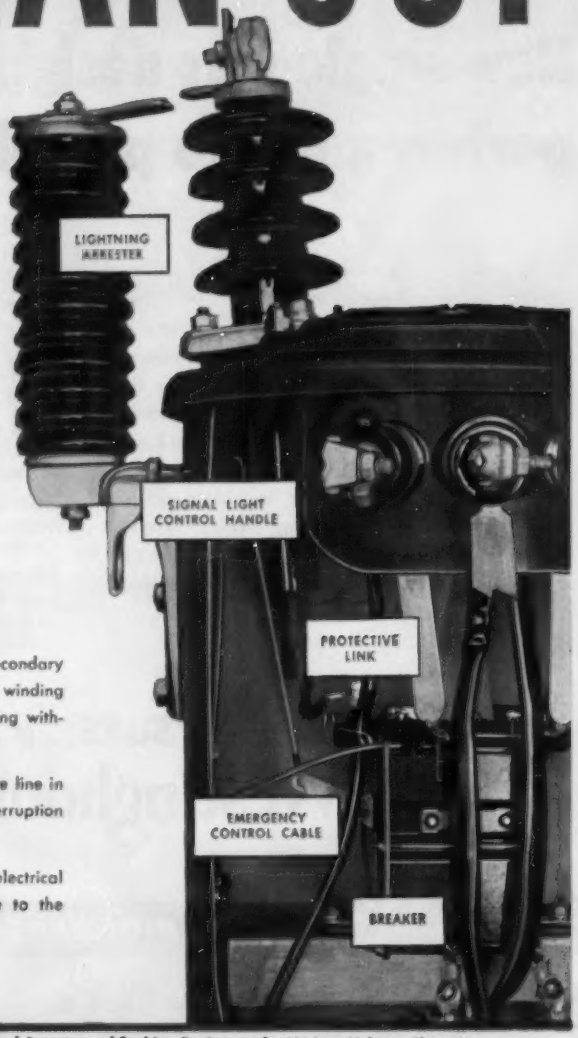
1918 Thermal Demand Meter

First practical answer to extension of demand rates to small, irregular loads. It featured bimetallic spring unit, led to introduction of combination thermal watthour meter in 1940.

1933 Socket Meter

The introduction of the socket meter in 1933 paved the way for outdoor metering—an outstanding contribution to the economy and simplicity of metering.

KUHLMAN CSP

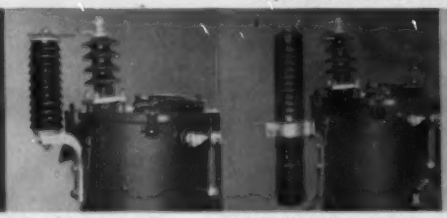


Four-way protection gives better service, longer life at lower cost

1. **Protects customer service** by signaling a warning in growing load areas before overloading occurs and providing for emergency overloads.
2. **Protects transformer life** by providing a secondary breaker that operates within the safe limits of the winding temperature and protects against unsafe overloading without sacrificing short-time overload capacity.
3. **Protects the line** by clearing transformer from the line in case of internal failure and preventing service interruption to the remaining transformers on the line.
4. **Protects against lightning** by safely bypassing electrical surges without interruption of service or damage to the transformer.

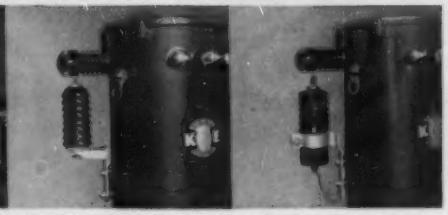
Optional Arrester and Bushing Equipment for Various Voltage Classes

Breaker Operating Handle with Warning Light and Emergency Control Lever.



Expulsion Type Arrester with Isolating Gap. **Valve Type Arrester with Isolating Gap.**

Voltages above 5,000 Volts—Mountings Interchangeable.



Expulsion Type Arrester with Isolating Gap. **Valve Type Arrester with Isolating Gap.**

Voltages below 5,000 Volts—Mountings Interchangeable.

165

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month

AUGUST

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Pacific General Meeting, Butte, Mont., Aug. 15-18.

STANFORD RESEARCH INSTITUTE—Symposium on Electronics in Automatic Production, Sheraton-Palace Hotel, San Francisco, Aug. 22-23.

WEST COAST ELECTRONIC MANUFACTURERS' ASSOCIATION—1955 Wescon Show, Fairmount Hotel, San Francisco, Aug. 24-26.

SEPTEMBER

SECOND WESTERN AREA DEVELOPMENT CONFERENCE—Sponsored jointly by Stanford Research Institute, the American Industrial Development Council and the Pacific Northwest Trade Association, Multnomah Hotel, Portland, Ore., Sept. 8-9.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Grand Teton Lodge, Jackson, Wyoming, Sept. 11-14.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—2nd Electrical Conference of the Petroleum Industry, Shamrock Hotel, Houston, Tex., Sept. 12-14; Industrial Electronics Conference, Rackham Memorial Auditorium, Detroit, Mich., Sept. 28-29.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Cleveland, Ohio, Sept. 12-16.

INSTRUMENT SOCIETY OF AMERICA—10th Annual Conference and Exhibit, Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Calif., Sept. 12-16.

EDISON ELECTRIC INSTITUTE—Accounting Division Organization Meeting with American Gas Association, Netherlands Plaza Hotel, Cincinnati, Sept. 13-14; Home Service Committee Meeting, Detroit, Mich., Sept. 14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Sept. 19-21; Industrial Power and Heating Group, EEI Headquarters, New York, Sept. 22-23; Purchasing and Stores Committee, EEI Headquarters, New York, Sept. 26; Transmission and Distribution Committee, Jung Hotel, New Orleans, Sept. 29-30.

ASSOCIATION FOR COMPUTING MACHINERY—Annual Meeting, University of Pennsylvania, Philadelphia, Sept. 14-16.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—37th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Va., Sept. 15-18.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass, Sept. 17-21.

SYMPOSIUM ON ELECTRONIC AUTOMATION—University of Pennsylvania, Irvine Auditorium, Philadelphia, Sept. 19-20.

SOCIETY OF INDUSTRIAL PACKAGING AND MATERIALS HANDLING ENGINEERS—10th Anniversary Meeting, Kingsbridge Armory, New York, Sept. 19-22.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21; Transmission and Distribution Meeting, Fort Bedford Inn, Bedford, Pa., Sept. 29-30.

NATIONAL INDUSTRIAL CONFERENCE BOARD—Marketing Meeting, Waldorf-Astoria Hotel, New York, Sept. 21-23.

NORTHWEST PUBLIC POWER ASSOCIATION—Accounting Section, Tacoma City Light Auditorium, Sept. 22-23.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 22-23.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section and Subcommittee Meetings, Charlotte Hotel, Charlotte, N. C., Sept. 22-23.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Petroleum Conference, Hotel Roosevelt, New Orleans, La., Sept. 25-28; Solid Fuels Conference with American Institute of Mining and Metallurgical Engineers, Neil House, Columbus, Ohio, Oct. 19-21.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—Pacific Zone, Annual Convention, Empress Hotel, Victoria, B. C., Sept. 25-28.

SYMPOSIUM ON ELECTRONIC AUTOMATION—University of Pennsylvania, Irvine Auditorium, Philadelphia, Sept. 26-27.

ATOMIC INDUSTRIAL FORUM, INC—1st U. S. Trade Fair, Sheraton-Park Hotel, Washington, D. C., Sept. 26-30.

STANDARDS ENGINEERS SOCIETY—4th Annual Meeting, Hotel Statler, Hartford, Conn., Sept. 29-Oct. 1.

OCTOBER

EDISON ELECTRIC INSTITUTE—Meter and Service Committee, Hotel Syracuse, Syracuse, N. Y., Oct. 3-5; Prime Movers Committee, Hotel Cleveland, Cleveland, Ohio, Oct. 3-5; Electrical Equipment Committee, Shoreham Hotel, Washington, Oct. 17-18.

NATIONAL ELECTRONICS CONFERENCE, INC—Hotel Sherman, Chicago, Oct. 3-5.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Oct. 3-7.

INDIANA ELECTRIC ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 5-7.

PUBLIC INFORMATION PROGRAM—Workshop Conference, Chase-Park Plaza Hotels, St. Louis, Mo., Oct. 5-7.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Sales & Rural Conference, President Hotel, Kansas City, Mo., Oct. 5-7.

CANADIAN ELECTRICAL MANUFACTURERS ASSOCIATION—11th Annual Meeting, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 5-7.

INTERSTATE POWER CLUB—Meeting, Hotel Martinique, New York City, Oct. 10.

OKLAHOMA UTILITIES ASSOCIATION—Electric Light and Power Division, Eastern Section, Okmulgee, Okla., Oct. 13 and Western Section, Norman, Okla., Oct. 14; Accounting Section, Lawton, Okla., Oct. 21.

FUND FOR PEACEFUL ATOMIC DEVELOPMENT, INC—International Atomic Energy Exhibit, Carnegie Endowment International Center, New York City, Oct. 20-Nov. 3.

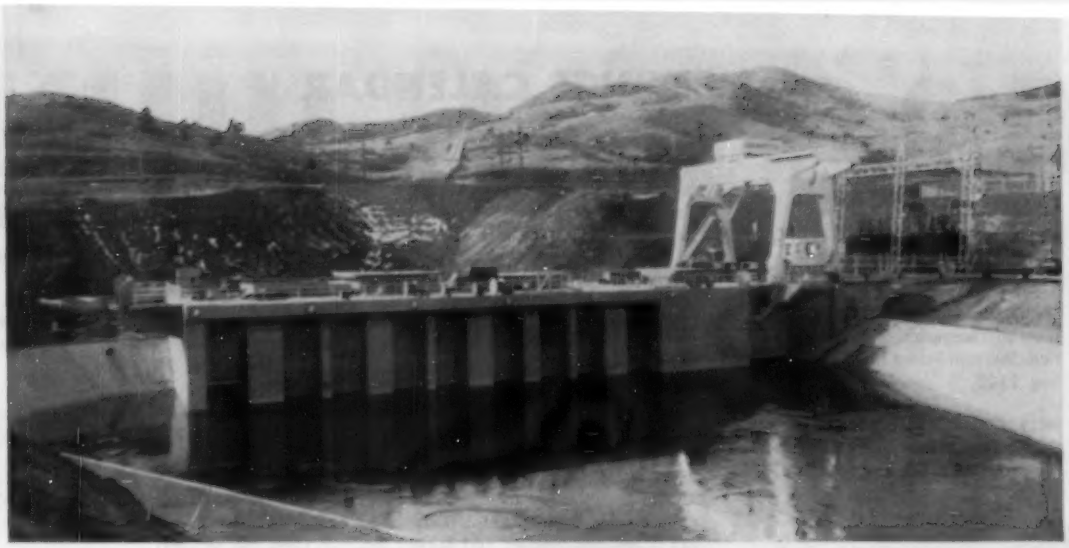
NATIONAL INDUSTRIAL CONFERENCE—Board Meeting, Waldorf-Astoria Hotel, New York, Oct. 20; Special Atomic Energy Conference, Waldorf-Astoria Hotel, New York, Oct. 26-28.

NORTHWEST PUBLIC POWER ASSOCIATION—Power Use Section, Seattle City Light Auditorium, Oct. 20-21.

SOUTHEASTERN ELECTRIC EXCHANGE—Accounting Conference, Hotel San Carlos, Pensacola, Fla., Oct. 20-21; Sales Conference, Biltmore Hotel, Atlanta, Ga., Oct. 27-28; Public and Employee Information Section, Biltmore Hotel, Atlanta, Oct. 27

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—67th Annual Convention, Grove Park Inn, Asheville, N. C., Oct. 24-27.

AMERICAN STANDARDS ASSOCIATION—Sixth National Conference on Standards, Washington, D. C., Oct. 24-26.



Flatiron Plant of Colorado—Big Thompson Project Where . . .

2 Speeds Aid Pump-Turbine Efficiency

GENERATION
Design-Operation

Unit will run at 300 rpm as a pump and at 257 as a generator. Slower speed will increase capability in slack water seasons

H. R. **BROWN**, Power Operation and Maintenance Officer, and

J. M. **EYER**, Electrical Engineer, Power Studies Branch, Region 7, Bureau of Reclamation, Denver, Colo.

Improved generation efficiencies over the entire expected range of heads mark the installation of the first two-speed pump-turbine by the Bureau of Reclamation at its Flatiron Plant of the Colorado-Big Thompson Project. Unit will run at 300 rpm as a pump and at 257 rmp as a generator. Particularly significant is the considerable gain in generating efficiency at the lower heads attained by the slower speed.

Water Diversion Primary

The Colorado-Big Thompson Project has the primary purpose of transmountain diversion of surplus water from the Colorado River headwaters on the western slope of the Continental Divide to the eastern slope. About 260,000 acre-ft of water will be diverted in the average year. A secondary purpose is the generation of electric energy as the water falls about 2,800 ft on the eastern slope.

Surplus water from the Colorado is lifted a maximum of 181 ft for delivery into Grand Lake. Water then flows by gravity through the 13-mile Alva B. Adams Tunnel to the eastern slope where it passes through a series of canals, siphons, penstocks, and power plants.

Flatiron is the last plant in this series. After the water passes through its two main turbines into the afterbay, it either flows by gravity to Horsetooth Reservoir or is pumped to Carter Lake Reservoir, about 250 ft above the Flatiron afterbay. Both these reservoirs provide terminal storage for water diverted during the non-irrigation season.

Two Hydro-Turbines Also

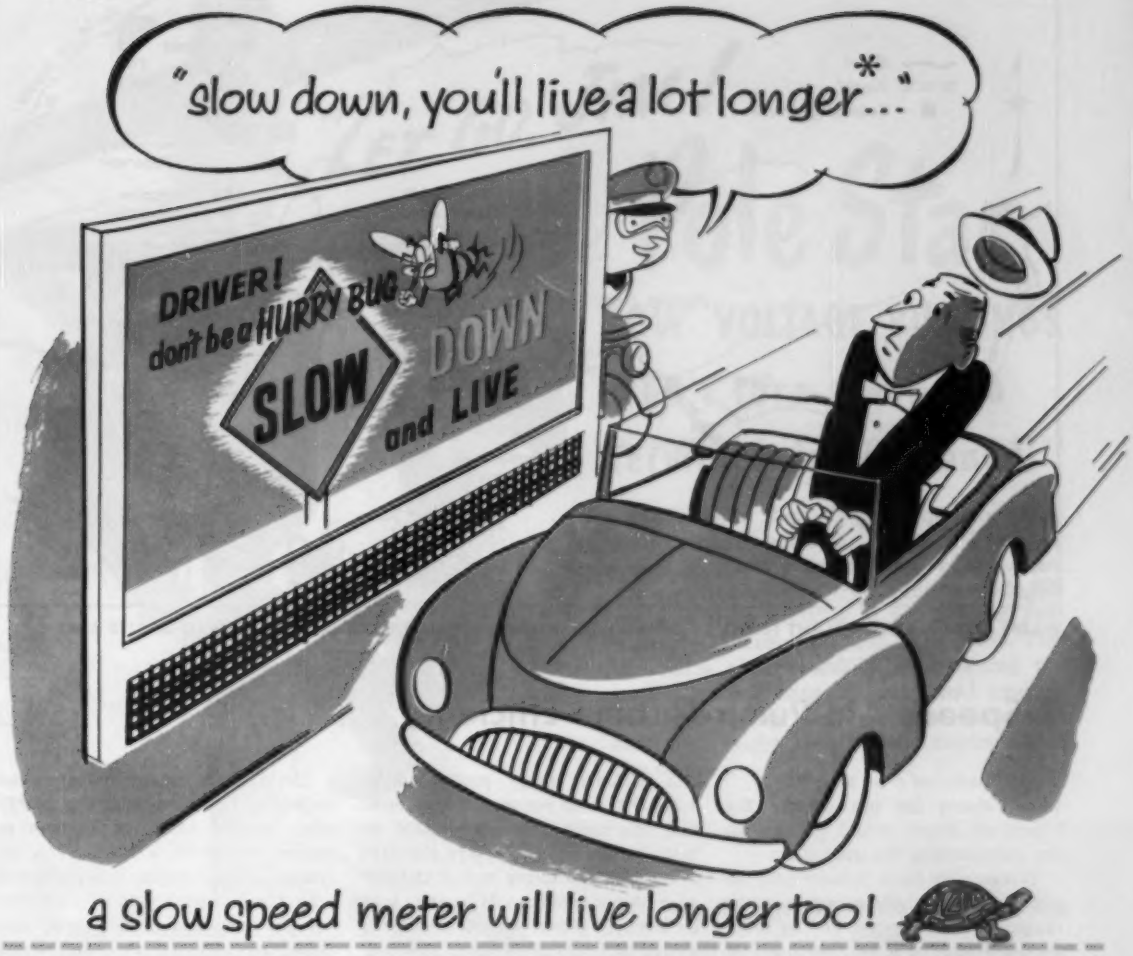
During the irrigation season, however, water stored in Horsetooth Reservoir is released to the Cache La Poudre River; water from Carter Lake is released to the St. Vrain, Big Thompson, and Little Thompson Rivers. Water to be released to the Big Thompson River is returned to the Flatiron afterbay through the pump-turbine and used for making power.

For operational purposes Flatiron power and pumping plant is integrated with the Western Division, Missouri River Basin Project. The plant provides base load and peaking generation. It contains two conventional hydro-turbines as well as the two-speed pump-turbine unit. Conventional units are vertical-shaft, reaction-type, 514-rpm hydraulic turbines. Each has 48,000-hp capacity at full gate opening when operating under an effective head of 1,055 ft. Generators each have a capacity of 35,000 kva at 13.8 kv and 90% power factor.

Pump-Turbine Economical

Topography in the vicinity of Flatiron and Carter Lake suggested a pump-turbine as the most economical installation among the many possibilities for transporting water to and from Carter Lake. However, the wide range of heads to be encountered in the annual filling and emptying cycle of the reservoir made reverse generation practical only when large volumes of water were being released from Carter Lake into the Flatiron afterbay during the irrigation season. Under normal operation it was expected that between 80,000 and 100,000 acre-ft would be pumped into the 112,380-acre-ft reservoir each year between October and June. Pump size was selected so that pumping could be done in a maximum of 16 hr a day to permit use of off-peak energy for pumping. During June through September, about 25% of the imported

(*Continued on page* 46)



a slow speed meter will live longer too!

Whatever you're doing, wherever you are, you'll live longer if you slow down. Slow speed equipment will live longer too . . . because there's less wear, less friction. Thats why the slow speed Sangamo J2 Watthour Meter lasts longer than other meters . . . *because the disk speed of the J2 is a full 40% slower* than the disk speed of any other watthour meter on the market.

The J2 meter with its 6. constant needs less compensation for accuracy from the lightest loads to its full capacity of 100 amperes. And the remarkably good and *uniform* load characteristics of this slow speed design have been proved on utility companies' lines throughout the country.

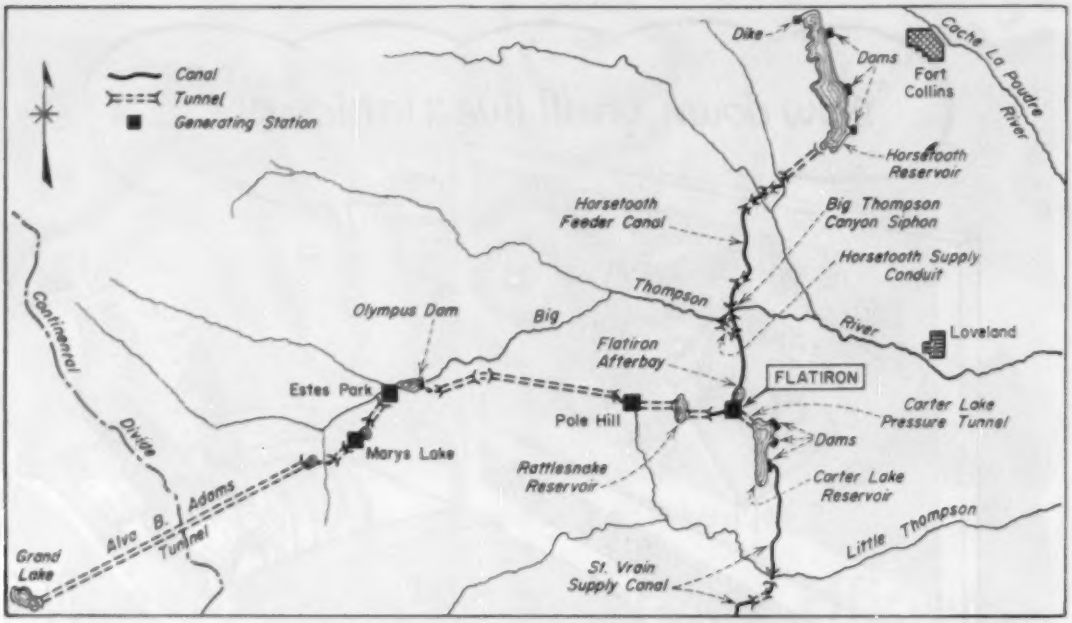
JM55-6

***DO YOUR PART—"SLOW DOWN AND LIVE"** The nation-wide "Slow Down and Live" traffic safety campaign, sponsored by the National Conference of State Safety Coordinators, is underway and will continue through Labor Day. Started in 1953 by a group of northeastern states, this campaign was so successful, it was extended to 24 states last year. The result: 601 lives saved. The National Safety Council estimates the 1955 campaign among all states will save 1100 lives if as successful as the 24-state campaign last year. So do your part—"Slow Down and Live."

SANGAMO

THE J2 METER IS THE SLOW SPEED METER

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS



WATER FROM FLATIRON PLANT FLOWS BY GRAVITY TO HORSETOOTH RESERVOIR OR IS PUMPED TO CARTER LAKE

2 Speeds Aid Pump-Turbine Efficiency

(*Continued from page* 44)
water, stored for use on the Big Thompson River, would go through the pump-turbine for generation.

Studies were made to determine the possible gain in efficiencies over the range of head for generation by using a lower speed for generation than that used for pumping. Better efficiencies at lower heads were particularly desirable because the reservoir usually starts filling in October but does not reach a very high elevation until after December when system peaking capacity is most critical. As the two-speed pump-turbine would cost about $200,000 more than a one-speed unit, the decision to install it was based on a comparison of the increased value with the increased cost.

257 RPM Better for Generation

Studies and model tests showed that use of 257 rpm for generation increased performance and efficiency at the lower heads enough to increase December capability about 2,000 kw. Although greater increases in capability would be possible in other months, the December value was used for evaluation. Slower speed for generation also increased annual peak energy production by 1,130,000 kwhr and seasonal energy production by 1,250,000 kwhr per year. It was found that this peak production could be held a minimum of 2 hr daily, five days a week, except during part of October when the reservoir would be at its lowest level. To obtain this increased peak energy production, increased pumping energy of about 1,340,000 kwhr annually would be necessary.

Basic Criteria Listed

Because there would be a few weeks each year when additional capacity would not be available and because the additional capacity would be available under minimum conditions in December for only 2 hr during system peak, conservative capacity values were assumed. These were the basic criteria for evaluation:

1. Peaking capacity evaluation in any month would be limited to the capacity available in December.

2. Peaking capacity would be valued at $0.75 per kw per month, provided it was available for at least 2 hr daily, five days a week.

3. All energy generated, seasonal or on peak, would be valued at 4.5 mills per kwhr.

4. Cost of off-peak energy for pumping would be 4.5 mills per kwhr.

Evaluating increased production and deducting increased pumping energy costs resulted in a net increase in annual income of $21,000. This increased annual income was compared with the increased cost of $200,000 for the two-winding two-speed machine over that of the single-speed machine. Annual income was capitalized at 3% for 20 years, giving a capitalized value of about $310,000. This capitalized value is slightly more than 150% of the increased cost of the two-speed unit. Economy of operation favored two-speed pump-turbine.

Pump-Turbine Rating

The pump-turbine is essentially a pump with six impeller vanes but with fixed stay vanes like a turbine. It operates at 300 rpm when pumping. Motor nameplate rating is 13,000 hp, 13.8 kv, and unity power factor. When operating as a generator, the unit runs at 257 rpm and is rated at 8,500-kva output, 13.8 kv, and unity power factor. The water carriage system between the unit and Carter Lake is an 8-ft dia steel penstock and pressure tunnel 1.2 miles long. A butterfly valve at each end of the system provides for control of the unit and

(*Continued on page* 48)

"LET GO, JIM!

Pole Star®

LOW VOLTAGE BUSHINGS won't turn when the terminal is tightened!"

That's right, Jim . . . you can drop that anchor wrench and relax. The new Pole Star locked-in, low voltage sidewall bushing features a double-keyed construction that prevents it from rotating in whole or in part when the line connection is being made. This eliminates the possibility of loosening the inside bushing connections . . . and guarantees against any disturbance of the gasket seal that might result from movement of the bushing.

You see, the opening in the tank wall has a projection like this ⬟ that engages a corresponding groove in the porcelain of the bushing. Also, the terminal is locked to the porcelain with a similar key-and-slot arrangement so that the entire bushing assembly is securely locked in place.

This new double-keyed low voltage bushing is a Pole Star standard for single phase units up through 167 Kva. The terminals are suitable for use with either copper or aluminum conductors.

Pole Star Distribution Transformers are available in single phase sizes from 3 through 500 Kva, 480 through 67,000 volts.

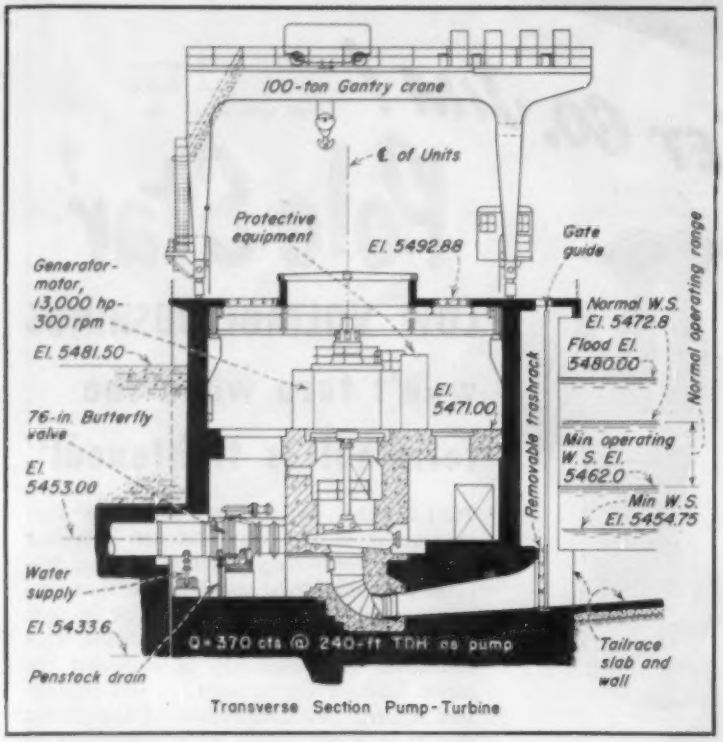
POLE STAR

Distribution Sales Department

Pennsylvania Transformer Company

A McGraw Electric Company Division

CANONSBURG . PENNSYLVANIA



CUTAWAY OF TWO-SPEED PUMP-TURBINE AT FLATIRON PLANT

(*Continued from page* 46)

for unwatering. A 42-in. submerged tube valve by-passes the unit when irrigation requirements exceed turbine water capacity.

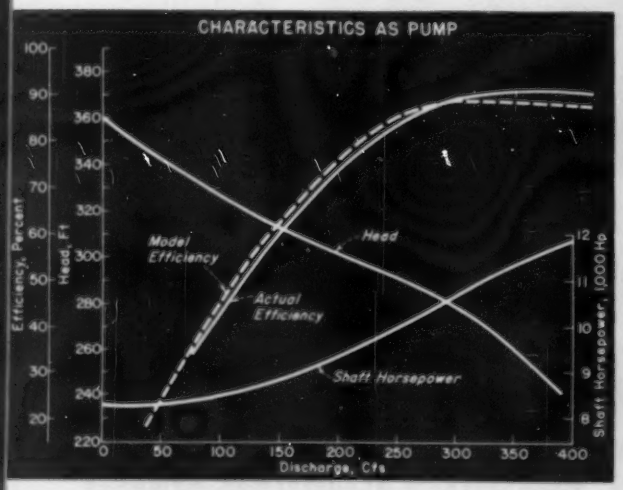
The unit is designed to operate over the entire head range from 290 to 140 ft as a turbine and 300 to 170 ft as a pump. When Carter Lake is low, it is necessary to throttle the discharge valve. Because the unit has no wicket gates and no governors, it always must generate at full gate for best efficiency.

The generator stator has two electrically independent windings, each wye-connected and designed for either grounded or ungrounded neutral operation. The winding used for generating at 257 rpm has 28 poles; the winding used for pumping at 300 rpm has 24 poles. Two-speed operation is obtained through use of a special field winding and by switching the two-winding stator. The windings are switched by selector switches in a cubicle of the 13.8-kv switchgear.

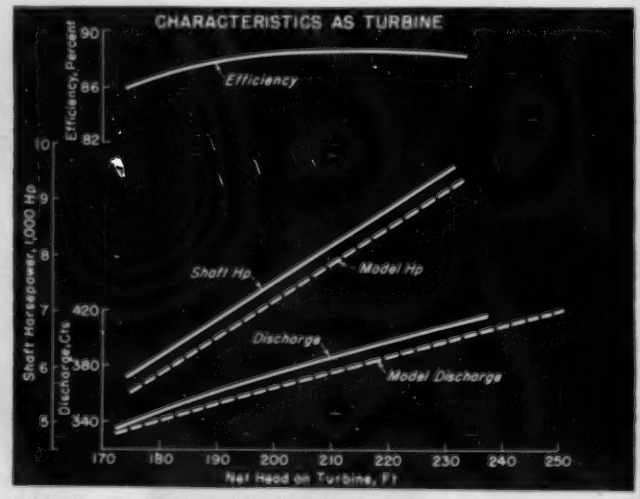
Salient-pole rotor is wound for 24 poles which are divided into four groups of five poles each and a group of four dispersed poles. One dispersed pole is located between each of the four main pole groups. Each of the two diametrically-opposed groups of five poles is connected in series, as are the four dispersed poles. Five leads are brought out from the windings.

For motor operation the 24-pole stator winding is used. The 24 poles of the rotor are connected in series through selector switches in the conventional manner. For generator operation the 28-pole stator winding is used. The 24 poles of the rotor are connected to form four additional apparent or consequent poles to obtain the necessary 28 poles.

As a pump, the unit is started at full voltage. To reduce the duration of system disturbances, the impeller can be unwatered by compressed air. After the unit has been synchronized, the air is released and the discharge butterfly valve opened. The unit can



TURBINE PERFORMANCE as shown by single efficiency curve should exceed warranted efficiency of 75%. Discharge and horsepower curves show agreement between unit and model



PUMPING EFFICIENCIES of the actual unit agree closely with those of the model based on preliminary curves. It appears that warranted efficiency of 84% will be exceeded by unit

be started across the line with the pump casing full of water. It also can be started by connecting it to an isolated generator and operating at reduced speed and voltage. The unit comes up to speed simultaneously with the generator, either with the pump casing water or unwatered.

Normal manual shutdown procedure is to close the butterfly valve, adjust the excitation for proper line amperes and vars, and then open the circuit breaker. In case of power failure or should the breaker open automatically, the butterfly valve will close automatically.

The unit is started as a turbine by opening the butterfly valve partially and using a 6-in. by-pass valve as a vernier to obtain synchronous speed. Breaker is then closed and the butterfly valve opened fully to load the unit. With no voltage regulator on the unit, the generator voltage and reactive flow are controlled manually by a motor-operated field rheostat. It can be started across the line as a motor in the generating direction with the turbine casing unwatered. In this method the unit will accelerate and at the proper speed automatically apply field and synchronize with the power source.

The unit also can be started in the generating direction as a motor by connecting it to an isolated generator and operating at reduced speed and voltage to bring it up to speed simultaneously with the isolated generator. The turbine casing may be watered or unwatered. In addition, the unit may be started with the turbine and butterfly valve method, bringing the machine up to about 200 rpm and then closing the power circuit breaker. The unit will accelerate, automatically apply field, and pull into synchronism. Normal manual shutdown procedure from generation operation is to close the unit butterfly valve. The unit will reject load and run at no load on the system. Excitation then is adjusted for zero vars and the circuit breaker is tripped. The pump-turbine may be operated as a synchronous condenser in either direction of rotation.

After installation at Flatiron, heat run and over-speed tests for both motor and generator operation were performed, and pump and turbine efficiencies were determined. Test data indicate that when the unit is operating as a pump the efficiency is 91% at a total dynamic head of 240 ft and a discharge of 394.5 cfs. For turbine operation, maximum efficiency over-all will be 88% at 257 rpm with a discharge of 379 cfs under a 205-ft head. The expectancy for 257 rpm at 250-ft head with a discharge of 430 cfs is 88% efficiency. The unit has an over-all warranted efficiency of 84% when running as a pump and delivering rated output. As a turbine-driven generator, the warranted efficiency is 75%.

AEC Headquarters Site Chosen near Germantown

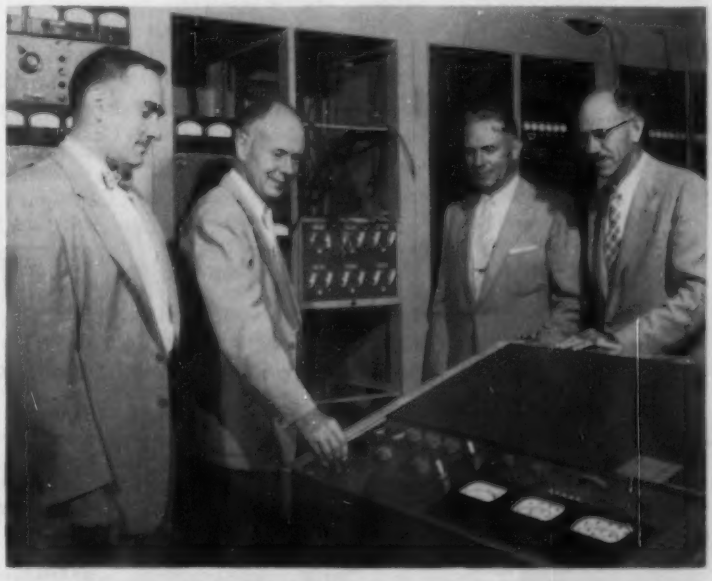
The Atomic Energy Commission has selected a site 23 miles from Washington, near Germantown, Md., for its new $10-million headquarters.

Construction contractor will be chosen by competitive bid. Work is expected to start in early 1956 on the three-story, reinforced-concrete office building. Garage, maintenance building, and parking area for 700 cars also are included in the plans. At least 50 acres will be needed.

Voorhees, Walker, Smith & Smith of New York City is architect-engineer. The firm worked with AEC in measuring more than 50 prospective sites as to water supply, supporting community facilities, accessability to Washington, labor market, and factors affecting economy of construction and operation as well as safety.

Uranium Plant in Canada

A $2.5-million atomic fuel processing plant, designed to make Canada self-sufficient in pure uranium supplies, is now being operated by the government-owned El Dorado Mining & Refining, Ltd, at Port Hope, Ont. Previously Canada has shipped uranium ore to the United States for processing.



Utilities Give Calculator to Wisconsin U.

A $240,000 network calculator, operated by 15 generators, was recently donated to the University of Wisconsin College of Engineering by the Wisconsin Utilities Association. The calculator, one of 48 in the world, will be used by electrical engineering students and Wisconsin power companies to study problems in transmission and distribution.

Shown above inspecting the device are (l to r) J. J. Skiles and H. A. Peterson, professors in the university's electrical engineering department; Carl J. Forsberg, Association president, and K. F. Wendt, dean of College of Engineering.

URGENT BUDGET QUESTIONS

for utility management men!

Q. Now—particularly in the face of continually increasing copper prices—is your utility giving immediate and urgent attention to making a complete conversion to aluminum?

Even before the recent copper price increase, major utilities all over the country have saved thousands of dollars a year by changing to Kaiser Aluminum conductors. The latest copper increase means they will now save even more! (See box below, right.)

Q. Have you discussed with your key personnel the great and growing price advantage of Kaiser Aluminum over copper?

Do they completely understand that the price spread between aluminum and copper is *continually widening* . . . that this spread is likely to *widen further* in the forseeable future? (See box below, left.)

Q. Is your utility fully aware of the complete services available to them to make conversion easy?

To help utilities take full advantage of the big savings offered by aluminum over copper, Kaiser Aluminum is ready to provide immediate technical assistance and field engineering service.

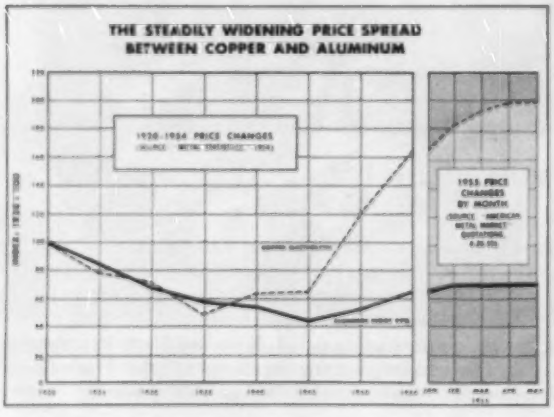
Q. Does your utility have the latest information on the rapidly changing aluminum connector situation?

We can put your utility in touch with manufacturers of recently improved copper-to-aluminum connectors that are giving satisfaction to utilities all over the country.

For complete cooperation, call or write Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Building, Chicago 11, Illinois. *Executive Office*, Kaiser Building, Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service



Estimate your savings with these Kaiser Aluminum weatherproof conductors:

	Per 1000 Ft. Lbs.	Cost
#6 Solid Copper TBWP*	112	$ 50.21
#4 Solid Alum PE (2/64)	48	26.90
#4 Solid Alum Neo (3/64)	64	26.90
#2 7 Strand Copper TBWP*	270	126.18
1/0 7 Strand Alum PE (4/64)	141	70.60
1/0 7 Strand Alum Neo (4/64)	172	70.60
2/0 7 Strand Copper TBWP*	522	223.31
4/0 7 Strand Alum PE (4/64)	261	138.00
4/0 7 Strand Alum Neo (4/64)	306	138.00
4/0 7 Strand Copper TBWP*	800	340.64
336400 CM, 19 Str. Alum PE (4/64)	388	216.00
336400 CM, 19 Str. Alum Neo (5/64)	489	231.00

June 1, 1955 prices based on 30,000 # — F.O.B. Destination
*URC Copper Triple Braid Weatherproof

INDUSTRIAL RELATIONS

K. K. Allen says that mutual respect of each other in daily relationship between management and the union is necessary for . . .

Living Profitably Under Union Contract

"Living Profitably Under the Union Contract" will be the subject of K. K. Allen, manager of industrial relations, Southern California Edison Co, when he addresses the Eighth Annual Round Table Conference at the Drake Hotel, Chicago, on Sept. 19-21. He will be the first keynote speaker of the conference sponsored annually by the Industrial Relations Committee of the Edison Electric Institute.

The other three keynote speakers and their topics are: "Using Manpower Effectively," C. Y. Osburn; "Making Communications Pay Off," Dewitt Pike, and "Making Employee Services Profitable," Neely Henry.

"How To Do It" discussion groups will follow the keynote addresses and are a feature of the conference. This will give members participating a chance to exchange practical, down-to-earth ideas and experience. The discussions are led by experienced industrial relations men selected from electric light and power companies.

Those who will act as conference leaders in the union contract group are: G. A. Beatty, personnel director, Ohio Power Co; C. H. Campbell, personnel director, Pacific Power & Light Co; F. M. Osta, director of employee relations, Niagara Mohawk Power Corp; H. A. Peterson, vice president, American Gas & Electric Service Co; and J. A. Talley, chairman of labor relations committee, California Electric Power Co.

In Allen's talk he will take the theme that long range planning, as well as carefully considered day-by-day decisions, is the key to profitable relationships under a union contract. First a company must establish a philosophy which encompasses both long range planning as well as day-by-day decisions.

Good bargaining, he will say, includes not only acting in good faith on such matters prescribed by law, as "wages, hours, and conditions of employment" but also what is the human and honorable thing to do. This imposes a responsibility on the company's representative to arrive at an equitable contract that is workable, efficient, and profitable to all. Clauses that unduly restrict management in its responsibility to manage are costly and should be avoided, Allen will warn.

In the day-to-day relationship between the members of management and the union membership, there must be mutual respect of each for the other. This mutual respect, says Allen, can best be developed by a clear understanding of and acceptance by both parties of the true sphere of the other's area of responsibility. Through such devices as supervisory training programs and proper communication lines, the management team can be conditioned to act efficiently and profitably its part under the union contract.

H. A. PETERSON

G. A. BEATTY

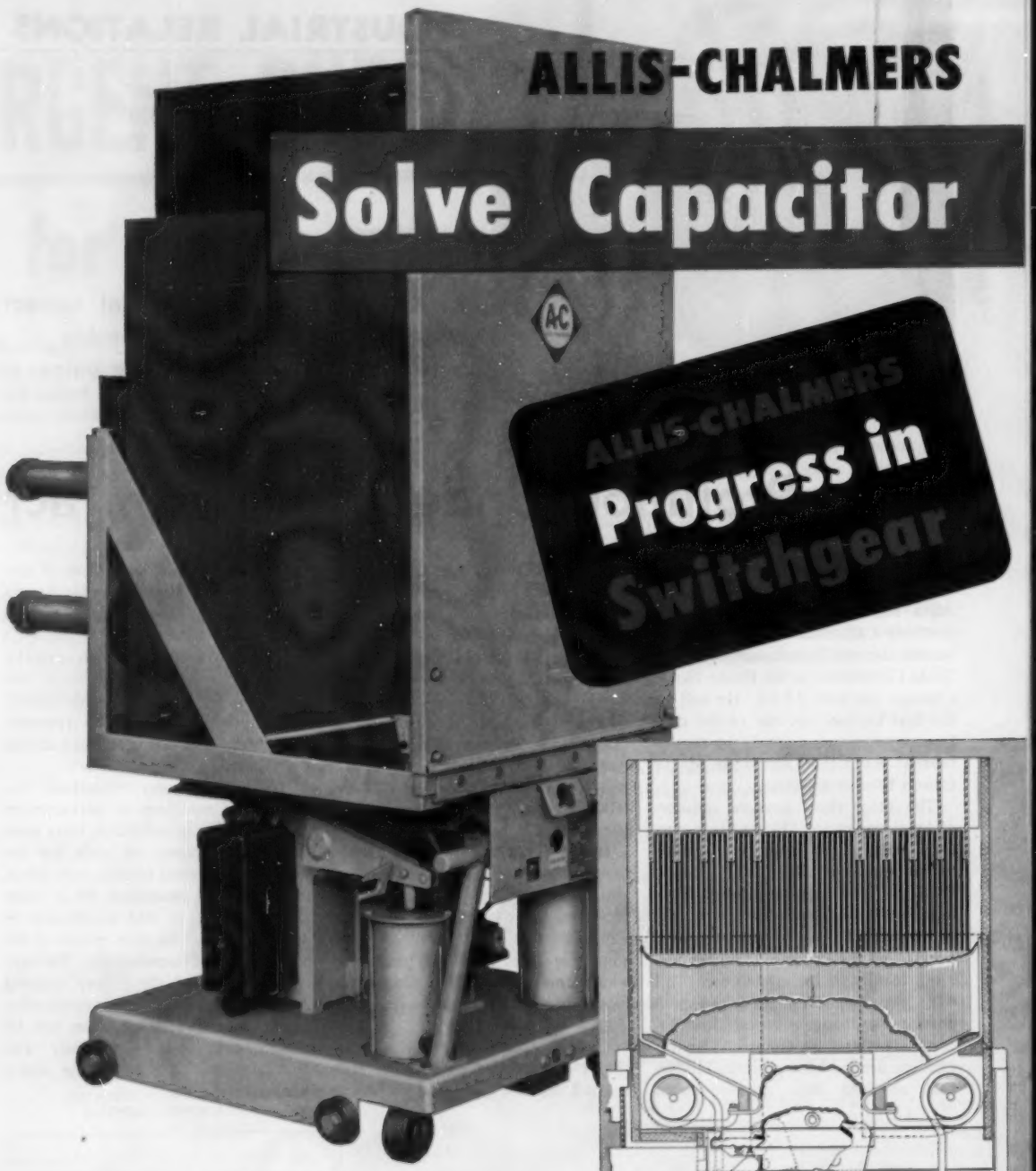
C. H. CAMPBELL

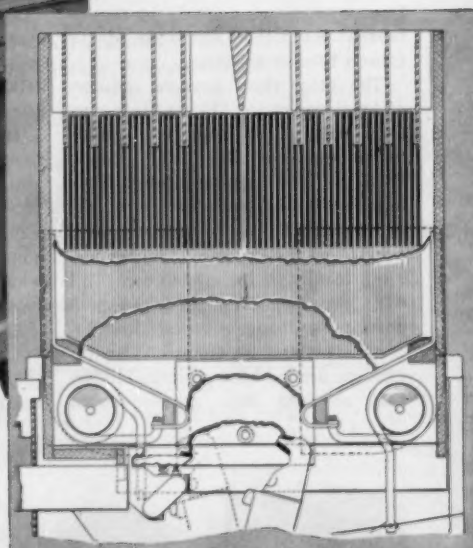
F. M. OSTA

J. A. TALLEY

ALLIS-CHALMERS

Solve Capacitor





Cross section of contact arrangement shows method of arc interruption.

A-C ALLIS-CHALMERS

ALLIS-

AIR MAGNETIC BREAKERS

Switching Problems

Provide this reliable means of capacitor switching as loads grow and capacitor usage increases

Allis-Chalmers air magnetic breakers are inherently suited to capacitor switching. High arc resistance plus highly efficient puffers combine to insure good interrupting performance over the full current range. Horizontal contact separation also aids breaker operation, since the natural thermal effect assists arc into arc chute.

GET INFORMATION

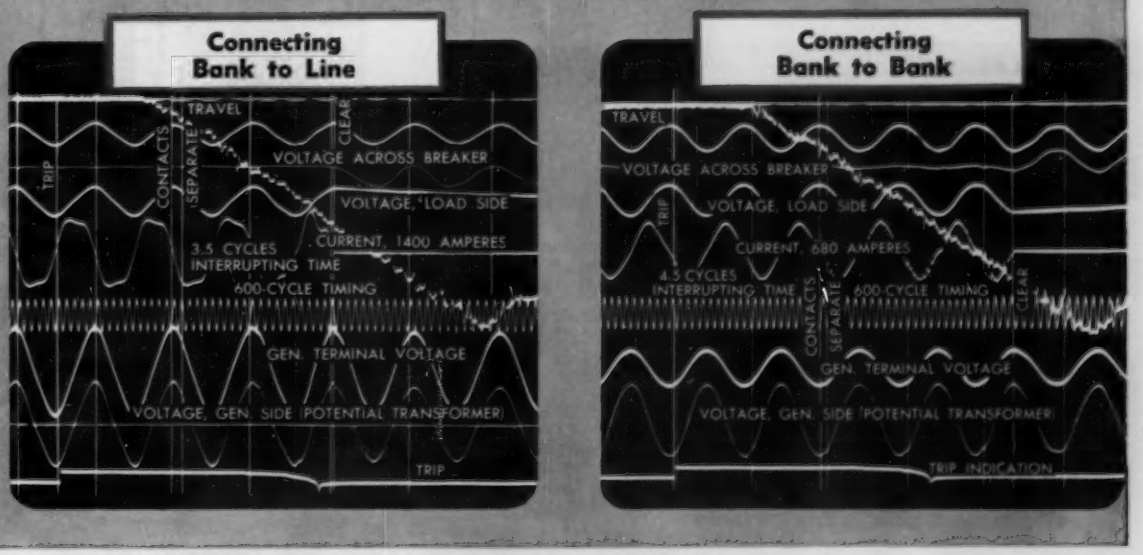
If you are having trouble now with capacitor switching or are planning to add capacitors, ask about Allis-Chalmers metal-clad switchgear utilizing *Ruptair* circuit breakers.

Call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

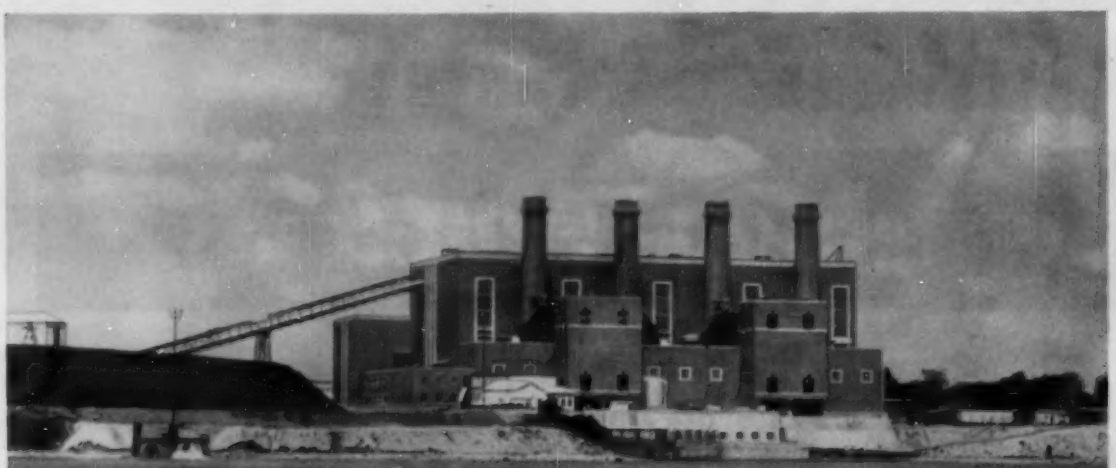
A-4570

Ruptair is an Allis-Chalmers trademark.

Tests Prove Fast Interruption With Minimum Voltage Disturbance



CHALMERS



PERFORMANCE RECORD

CONTROLLED CIRCULATION BOILER

POTOMAC RIVER STATION

Potomac Electric Power Company

The first of two C-E Controlled Circulation Boilers for the Potomac River Station of the Potomac Electric Power Company has now been in service just over one year. The performance figures for this boiler, for the period from July 14, 1954 to July 14, 1955, show the following principal results.

AVAILABILITY 93.94%

(In service or available. Not considered available while down for inspection or repair; while in process of starting up or shutting down; or during 12 day scheduled annual overhaul.)

USE FACTOR 93.94%

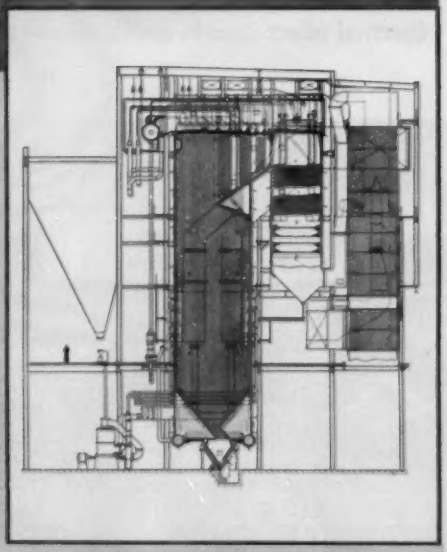
(Ratio of in-service hrs. to total hrs. — all outage not necessarily chargeable to boilers.)

CAPACITY FACTOR 109.38%

(Ratio of average hourly output — net kw — to nameplate rating of turbine-generator.)

AVERAGE EFFICIENCY 91.22%

100%



One of two C-E Controlled Circulation Boilers at Potomac River Station each of which serves a 90,000 kw turbine-generator (nameplate rating) operating at a throttle pressure of 1800 psi with a primary steam temperature of 1050 F, reheated to 1000 F.

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

Sylvania Electric Products, Inc., photo

Illuminated Ceiling Ups Light, Cuts Cost

Besides boosting lighting levels, new illuminated ceilings at Boston's Jordan Marsh Co department store provided solution to two major renovation problems: (1) They quickly and economically covered up ugly beams and exposed pipes (as shown in this partially completed installation). (2) They can be transplanted easily and at low cost to new buildings when existing buildings are razed. Still another feature: They eliminated need for decorative lighting fixtures. Ceilings are made up of panels which can easily be lifted out of place to allow maintenance men to reach conduits, air conditioning ducts, telephone lines, and other services. Cutting and fitting of panels were necessary only at walls and run-around.

Gas Range Sales Could Hit 3.2 Million in '55

There could be as many as 3.2 million gas ranges sold this year, declares the American Gas Association, if business conditions hold up to 1954 levels and product and promotional efforts operate at an optimum.

This compares with about 1.4 million electric ranges which at the present pace the electric industry will sell this year.

In a market study recently released, AGA finds that most of its sales could come as replacement for existing gas equipment—1,950,000 units. An additional 750,000 units could go into new housing, and 500,000 could replace competitive equipment.

The study also forecast that the industry could produce and sell 18.4 million gas ranges in the five-year period 1955 through 1959 if ideal conditions (at least as good as 1954) continue to prevail.

It points out, however, that if gas ranges maintain only the current level of consumer acceptance, the five-year total would fall to 11.5 million, and 1955 sales would be 2.4 million units.

No Service Entrance Charge for Dryers

West Penn Power Co will extend its no-charge service entrance policy to purchasers of 230-v electric clothes dryers as well as to those who buy ranges and water heaters.

The company also plans a flat-rate charge for circuit installation: $19.50 for ranges, $12.50 for water heaters, $19.50 for dryers with less than 5 kw heating capacity, $29.50 for dryers above 5 kw. Policy will go into effect Sept. 1.

HPF Looks Up

Manufacturers shoot for higher power factors to heat air conditioning's old bugaboo

Low power factor—a big utility problem in air conditioning—is starting to resolve itself. While there still exists a wide range in power factor characteristics among various units on the market, the trend is towards higher ratings (85 to 90%). This, at least, is the industry's consensus.

Next year should see most manufacturers turning out models with power factor substantially improved. That is the deadline which has been set by a joint committee of representatives from Edison Electric Institute, National Electrical Manufacturers Association and Air Conditioning and Refrigeration Institute.

General Electric Co, for example, says all models in its 1955 "HPF" line are in the 85 to 92% range. It claims a ½-hp, 115-v model now being made draws 40% less current than its 1954 counterpart. It requires only 7.5 amp, says GE, less than that drawn by a flat iron or toaster.

S&S SHORTS

Sell $4 Million in Ranges, Heaters

Range and water heater sales reached $4 million in two recent Florida Power & Light Co campaigns. Three-month "It's Tops" heater activity moved 13,987 units to hit 280% of its quota, while a "White Glove" range promotion sold 7,924 units or 132% of quota. Combined sales, both in terms of number and dollar volume were about twice those of similar campaigns a year ago.

Sales Meeting Is Sales Incentive

Carolina Power & Light Co incentivized its sales personnel by awarding a trip to a New York sales convention to the district manager who secured highest percentage of EAR in the utility's "Spring Frolics" campaign. Winner will attend Ebasco Services, Inc Client Companies Sales and Public Relations Conference next month.

Anaconda Produces Aluminum

Anaconda Aluminum Co has formally opened its $65 million primary aluminum plant at Columbia Falls, Mont. The company will start turning out ingots of the white metal later this month. Russell B. Caples, company president, said that he expects the new facility to reach planned capacity rate of 60,000 tons annually by Jan. 1, 1956.

The four 1180-ft long pot buildings contain two potlines with a total of 240 pots. First potline of 120 pots will start operation this month and the second line is scheduled approximately 60 days later. Each of the pots will produce from 1,400 to 1,500 lb of aluminum in a 24-hr period. After the plant gets into operation, the pots will be tapped every 24 hr.

Follows Pinchey Design

The new facility is an adaption of plant design of the Pechiney Co in France. The French technology is predicted to produce aluminum at the lowest rate of kilowatt-hour consumption. Air contamination controls are said to be the best known in the industry.

Raw material requirement for Anaconda's plant is 120,000 tons of alumina per year. It will be shipped via rail from Corpus Christie, Tex., and Hurricane Creek, Ark., plants of Reynolds Aluminum Co under long-term purchase contract. Key to aluminum production is power from Hungry Horse dam of the BPA system.

Production of the new plant is expected to be divided into four categories: Harvey Machine Co of Calif., Anaconda Wire & Cable Co; American Brass Co, and the open market.

Anaconda Wire & Cable has five separate fabricating aluminum mills. Its new aluminum rod-rolling mill at Great Falls, Mont., is reported to be almost completely automatic.

American Brass Co's $25 million integrated aluminum mill will be under construction soon at Terre Haute, Ind. It is expected to be in operation in the fourth quarter of 1956.

The new producer is 95% owned by Anaconda. A 5% interest in the company is retained by Harvey Machine Co of Calif. This relationship goes back to 1952 when Anaconda Aluminum Co was organized from Harvey Machine Co of Montana. Latter company had power contracts with the Bonneville Power Administration, a Certificate of Necessity, and other assets which were transferred to the Anaconda organization.

Emerson's New Warehouse

Emerson Electric Mfg Co of St. Louis recently dedicated a new 100,000 sq-ft warehouse adjacent to its main plant. The new facilities are expected to provide faster service to customers.

A-C Provides Surge Test for H-V Transformers

Allis-Chalmers Manufacturing Co has announced the availability of a new switching surge strength test for power transformers 115 kv and higher. The test, designed to simulate the most severe surges that can occur in normal use, will eliminate the one remaining major unknown factor in transformer insulation strength.

According to A-C engineers, the test is one more step in the establishment of realistic insulation levels for high-voltage transformers. The final goal is adequately protected transformers at considerably lower cost.

Recent improvements in lightning arresters have made it advantageous to purchase lower insulation level transformers for many application, according to A-C engineers. Reduction of excessive insulation strength without some means of proving the transformer's ability to withstand switching surges is believed to have held back acceptance of these lower strength (and lower priced) transformers.

Now, in addition to the standard 60-cycle, full-wave, chopped-wave and steep-wave impulse tests, all large high-voltage power transformer can be given a 3,000-microsecond high-frequency surge approximately 25 to 30% greater in value than the lightning arrester rating. For example, 330-kv units will be surged at 930 kv.

Crossarm Manufacturers Form An Association

West Coast Crossarm Association, a national association of West Coast woods crossarm manufacturers, was established July 12, 1955. The Association's objectives include pooling technical information, conducting research, collecting industry statistics, establishing and maintaining high quality standards, and the general improvement of the crossarm manufacturing industry. An important function will be to work with the American Wood Preservers Association, Edison Electric Institute and the West Coast Lumberman's Association on matters concerning crossarms.

Officers of the Association are:

(*More M & M on page 59*)

modernizing?

give new equipment the instrumentation it deserves

WHEN you're planning to install new process equipment, plan to take advantage of the full potential of modern methods of measurement and control. It's the sure way to get top value for your modernization investment . . . for the improvements in production economy, quality and versatility possible with today's new process equipment depend increasingly on control instrumentation.

Here are some specific suggestions for your own modernization plans:

New equipment should be designed for control. Instrumentation is not merely a necessary appendage. It's a vital, integrated part of the process itself. Control design goes hand in hand with process design. Honeywell's experienced application engineers will be glad to cooperate with your own staff or your consulting firm, to recommend ways to obtain the full benefit of modern instrumentation.

Each instrument should fit its function. This may seem obvious—but all too often, instrumentation has been stretched or squeezed to fit the application. In Honeywell's exceptionally wide line, you'll find instrumentation with exactly the right performance . . . at the right cost . . . for your process.

A talk with your nearby Honeywell field engineer will give you a detailed picture of what instrumentation can mean in your modernization program. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**
BROWN INSTRUMENTS
First in Controls

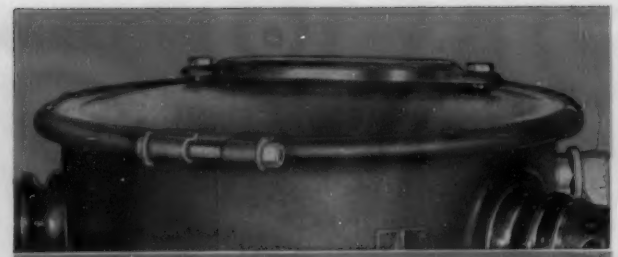
SHUR-SEAL COVER

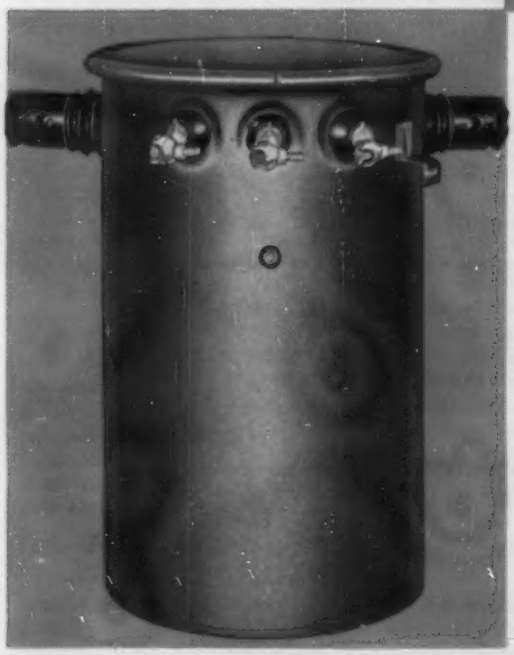
adds extra years of service life to

Wagner®

Form W

Distribution Transformers!





Wagner Form W Pole Type Distribution Transformers last years longer than many similar transformers on the market today for many good reasons. Among them is the fact that Wagner Transformers don't "breathe." They're sealed air-tight.

How? Wagner's exclusive Shur-Seal Cover is fitted with a clamping ring which maintains a uniform pressure, holding the cover tight to the tank. Although as air-tight as a welded tank, the cover may be removed by simply loosening a single, stainless steel bolt. No atmospheric moisture or dust particles can get inside. The inhibited oil used in Form W Transformers reduces oxidation to a minimum and retards the formation of acids and sludge which would eventually cause deterioration. Working together as they do, the Shur-Seal Cover and inhibited oil add years to the service-free life of Wagner Form W Distribution Transformers.

Other features of Wagner Form W Distribution Transformers...

HIGH VOLTAGE SIDEWALL BUSHING... for faster, easier, safer permanent connections. Lineman simply pushes conductor into the connector and tightens with a few twists of the knob. No tools are needed and the lineman is protected from accidental shock by the insulated knurled knob.

LOCKED LOW VOLTAGE BUSHING... Linemen never need worry about loose connections on the inner end of the terminal studs because the new, low voltage bushing assembly makes it impossible for these studs to turn when the terminals are being tightened. This feature also makes it safer for the lineman when connections are being made to the terminal.

FORM W TRANSFORMERS COME TO YOU IN DRUMS... Wagner Form W Distribution Transformers from 3 to 10 kva are now packed in sturdy, fiber drums for ease of shipping, handling and storage. Each drum is sealed so that when it is opened, the transformer is as clean and free of harmful foreign particles and grease as the day it left the Wagner plant.

Write for your copy of Bulletin TU-181. It gives complete information on Wagner Distribution Transformers.

WAGNER ELECTRIC CORPORATION
6456 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

TSD-6

(*Continued from page* 56)

President, Sid Levine of Santa Fe Tank & Tower Co; vice president, T. H. Schaffer of Joslyn Manufacturing & Supply Co; secretary-treasurer, G. H. Boyd of Hatheway Patterson Corp; excutive director, William E. Smith of Byrne Marcellus Co., a Trade Association Managemnt firm of Chicago.

Charter members of the Association are: American Cross-Arm, Inc, Jacksonville, Florida; American Crossarm & Conduit Co, Chicago, Ill.; Brooks Lumber Co, Bellingham, Washington; L. F. Carleton Manufacturing Co, Houston, Texas; R. G. Haley Co, Toledo, Ohio; Hatheway Patterson Corp, Jersey City, N. J.; Hatheway & Patterson Co, Inc, Mansfield, Mass.; Joslyn Manufacturing & Supply Co, Chicago, Ill.; Pennington Crossarm Co, Chicago, Ill.; and Santa Fe Tank & Tower Co, Los Angeles, Calif.

Color Code Identifies Pinco Packaged Insulators

Color code markings for quick, easy identification of insulator package contents have been introduced by Porcelain Insulator Corp of Lima, N. Y. This company is believed to be the first insulator manufacturer to develop and use the technique in insulator packaging. Pinco reportedly introduced the idea of packing insulators in corrugated cartons.

Color printing on the cartons identifies each insulator type, for example—Red for suspension types; Blue for low-voltage pin types; Green for high-voltage pin types; Red and Black for switch and bus units; and Black for all other types.

Style number and quantity is also printed in large, bold, legible type together with an insulator outline which immediately indicates the contents as pin, suspension, guy strain, or switch types. Each package tells the whole story—how many and what type.

Uptegraff to Expand

An expansion program for its Scottsdale, Pa., plant has been announced by R. E. Uptegraff Manufacturing Co. The transformer manufacturer is planning a 22,000-sq ft addition to existing facilities.

A. B. Chance Co Purchases Seyler Co

A. B. Chance Co., Centralia, Mo., purchased the Seyler Manufacturing Co of Pittsburgh, Pa., on July 13, 1955, according to F. Gano Chance, president of the Centralia firm. Seyler Co, a manufacturer of pole line hardware for the electrical and telephone industries, was founded in 1920.

Officers of the Seyler organization now are F. G. Chance, chairman of the board; Walter Kirkwood, president; Nathan A. Toalson, vice president and general manager; C. C. Hough, treasurer; and R. E. Ausmus, secretary. Kirkwood has been serving as president of the Seyler Co; the others hold the same titles with the parent firm.

This is the third major acquisition by the A. B. Chance Co in the past two years. The W. N. Matthews Corp and the Specialty Device Co were both purchased in 1953.

This expansion program will allow Uptegraff to participate in the trend toward greater integration of manufacturing processes. The new building will house improved equipment for the manufacture of transformer tanks as well as more advanced facilities for the production of small utility distribution transformers.

Rome Cable Announces Non-returnable Reels

In the interest of better serving the electrical industry, Rome Cable Corp of Rome, N. Y., has announced the adoption of non-returnable reels as standard put-up for certain of its wire and cable products. Introduction of non-returnable reels as standard put-up is an innovation in the wire and cable industry.

According to a company spokesman, it represents fruition of part of Rome Cable's long range planning for greater customer service. The non-returnable reels will be shipped without billing and will not be subject to return for credit. This "no deposit—no return" feature offers a number of distinct advantages through minimizing the keeping of reel records and eliminating the gathering and handling of reels for return. As quickly as present inventories are depleted the manufacturer expects that all shipments of applicable cable types and sizes will be on non-returnable reels.

L-M Packaged Cutouts Offer Handling Economies

Economies in materials handling have been made possible for purchasers of Line Material Co's PVD-56 cutouts. M. F. Beisber, director, market research and distribution, announced that L-M is now shipping packaged quantities of PVD-56 cutouts on disposable pallets at no extra charge to the purchaser. He stated that since this improved packaging method has been successful in achieving customer savings, L-M is investigating the possibilities of packaging other products by this method. The palletized package can be moved readily by a fork lift truck. Also it is said to improve storing and minimize possibility of breakage.

The PVD-56 cutout can be purchased in unit quantities of 60 per pallet or in multiples of 60 by this packaging method.

BUSINESS OUTLOOK

Electrical World
AUGUST 15, 1955

The outlook, in brief: Production is still high but no longer spurting upward. The summer heat has slowed output in some fields. Meanwhile, construction activity continues at a record clip. But tighter mortgage terms will slow homebuilding in coming months.

Observers are wondering: Is the amount of installment credit outstanding now too high? Does it threaten to puncture the boom in retail sales? Those who believe it does point to two things: First, the record high level of outstanding consumer debt. Second, the very rapid rate at which new credit is being extended.

Those who are not so worried point to the fine record of repayments and the high incomes of those using credit. Here are the facts:

Total consumer credit outstanding—installment, charge accounts, personal loans—as of June 30, was a record $32.5 billion. About $24.9 billion of this represented installment credit. And half of that is for the purchase of new and used automobiles.

This level of outstanding consumer debt is not so high (about 15%) when measured against the level of spendable consumer income—now running about $270 at an annual rate.

But here is the rub: The rate at which new installment credit has been extended recently has been greater than the rate of increase of spendable consumer income. In June alone the amount of installment credit extended was $3.4 billion,—that's an annual rate of over $40 billion.

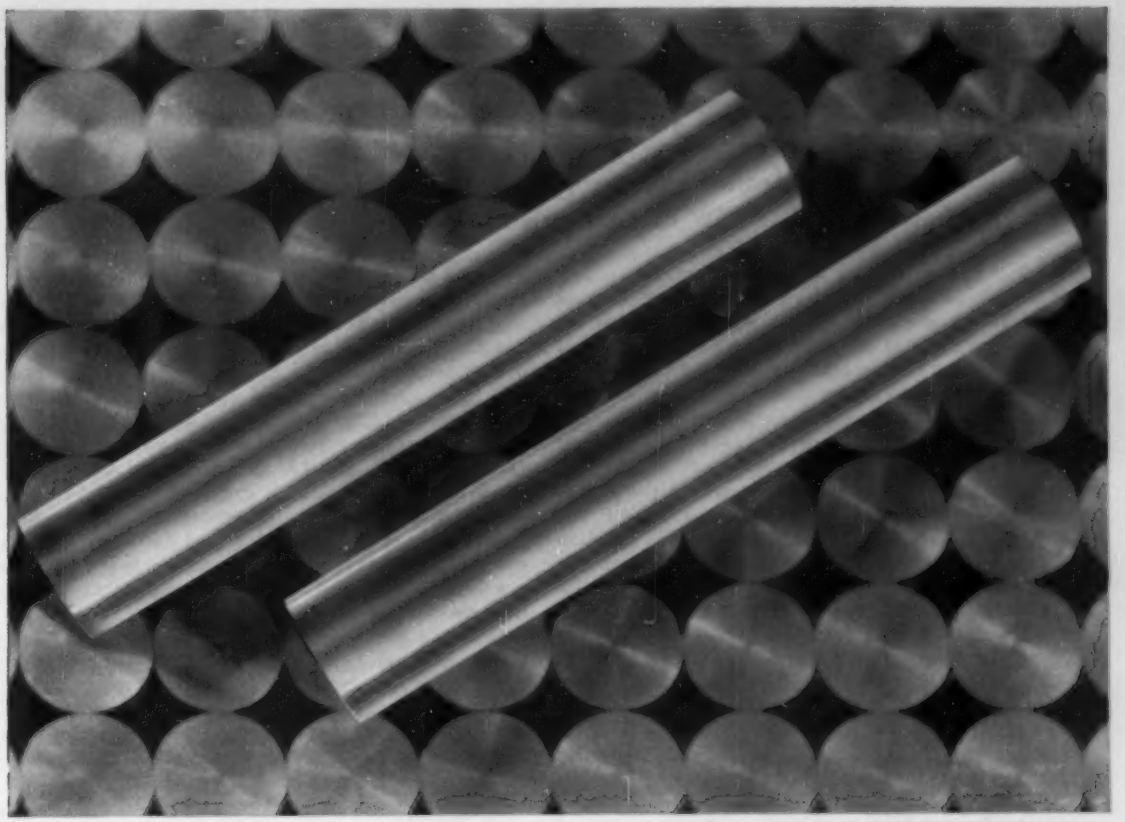
It's clear then that a good part of the record sale of durable goods—especially autos—has been due to the liberal extension of installment credit. Now the Federal Reserve Board is concerned. It no longer has the authority—which it had in 1950-52—to set installment credit terms. But it can still regulate the total amount of bank credit available to the economy. And it recently warned member banks to go easy.

Banks will therefore be screening loans more carefully from now on. They may, too, tighten up on loans to finance companies, which account for about a third of all consumer loans made. This may not cut back the quantity of consumer debt very much. But it will be more difficult for those people whom banks consider risky to obtain loans.

Recent action by the Federal Housing Administration and the Veterans Administration on mortgages is also prompted by concern over the inflationary effects of liberal mortgage terms. The total value of mortgages outstanding has risen to a record high of $80 billion. It's been mounting about $1 billion a month recently.

The Federal Housing and Veterans Administrations have now cut the repayment period on mortgages back from 30 to 25 years. The amount of down payments required has also been raised. This should slow down the rate of homebuilding in 1956.

A squeeze on bank loans to businessmen is more of the same medicine. In past months business borrowing has been increasing at a record clip. Now the Federal Reserve Board has raised the discount rate to member banks. And this means stiffer terms for the banks' customers.



Atomic reactor fuel elements—a few of many thousands produced by Sylvania's nuclear fuel manufacturing facilities, Hicksville, N. Y. Fuel shown ¾ actual size.

10,000 tons of coal . . . 1955 style—

WHEN YOUR PLANNED atomic energy power plant is completed, *reactor fuel* will become as important to your operations as coal, gas or oil is today.

Recognizing this, wise planners in atomic energy are investigating reactor fuel sources *now* . . . discovering that Sylvania has long been a leading producer of nuclear fuel elements and reactor components.

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IN THE INDUSTRY

Sweltering Heat Hits Utilities

What happens when temperatures above 90 and high humidity strike service areas? To find out, EW checked eastern systems and found them 'boiling'

In our Aug. 1 issue the weekly output curve ran right off the top of the graph shown on our Electrical Week page. Torrid temperatures combined with dripping humidity over much of the nation during July and August have affected utilities in other ways than increased loads. Here are some of the reports recently received from a spot check of electric utilities east of the Mississippi:

• There's been a sharp increase in 24-hr output of kwhr but without corresponding increases in daily peak kilowatt load. As a result daily load factors are up sharply. In New York Consolidated Edison Co's Aug. 2 DLF was 74% vs 68% on Dec. 21 last; these are also the dates of new and old max send out records of 49.5 and 50 million kwhr respectively.

• The jump in load factor was good news on the cash register but bad news for cables under blistering city streets. The long dry spell and the hottest July combined to dry out soil around duct banks, boosted soil heat resistivity thus hindering heat dissipation. Several seaboard cities reported increased feeder cable failures in spite of the use of water, blowers, and in one case dry ice to cool the ducts and cable. Con Edison measured 80C (176 F) in one empty duct.

• Minimum daily loads, which usually come around 4 AM, were up sharply but lagged hot spells by two or three days apparently as heat-frazzled citizens desperate for sleep in sweltering homes and apartments turned on every fan in sight and left them on around the clock. One metropolitan system said its 4 AM load jumped from about 800 to 1,000 Mw in three days under such a heat spell.

• A sizzling Aug. 2 set records on several eastern systems. Area 5 — Eastern Pennsylvania, New Jersey, and Delaware — set a new summer peak of 6,650 Mw but failed to top last December's 6,871-Mw peak. Con Edison hit a new *daylight* peak of 2,906 Mw but was short of last December's 3,047 Mw.

• One system operator shook his head and said wryly, "My load sheet just doesn't look right these days. I keep thinking it ought to be dated January or February to go with these figures."

• Air conditioners and fans were punching a distinct imprint on load records. In Philadelphia, for instance, July 18 set a new summer peak of 2,347 Mva that topped last December's 2,265 Mva. But the kilowatt peak for the same day was not a record and was 4% short of last December's peak. Another system reported kw load up 12.8% but reactive up 32% compared with 1954's corresponding period. This underlined once again the low power factor of air conditioning and fan load. Out on systems this low power factor was reflected in low voltage.

• Some New England areas that count heavily on hydro from the north to supply industrial centers in the south were having a tough time getting transmission lines out for maintenance. Expected vacation slumps in load were wiped out by hot weather load increases and required extra draw down of northern ponds already dryer than expected.

• Some of the old load estimating rules were getting hard looks. Almost universally system operators are studying the effect of humidity on loads. Humid days found load jumping higher than accepted rules said it should.

• In Area 6—the Baltimore-Washington axis—systems were experiencing exceptionally heavy loads. The area load as a whole on Aug. 2 was 1,728 Mw, up 145 Mw over the summer of 1954. Air-conditioned Washington load at 811 Mw was up 70 Mw over last summer.

• Experience in the Midwest was not far different from that on the seaboard. In Chicago, Commonwealth Edison set a new send out record of 56,830,000 kwhr, topping the previous record of Jan. 27, 1955 of 56,627,000. The day before it came within 1½% of equalling its record peak of 3,384 Mw on Dec. 22 last year.

• At Kansas City, KCP&L set a new peak load record of 542,500 kw which was 1.8% above last year's, 20.2% above 1953's annual peak. And don't forget last summer brought the "heat storm" to the plains states.

TECHNICAL NOTES

Load division between cables must be controlled because incremental cost of larger cable is excessive. A tap-changing transformer connected to regulate at 60 deg leading provides economical solution.

Tower footing corrosion would probably accelerate if a ground fault should raise neighboring ground potential enough to puncture the mastic coating or insulated joint of a nearby pipe line and thus extend the spread of galvanic currents.

Converting remaining dc equipment on customers' premises to ac operation now exceeds $500 per kw of system demand. Rectifiers in ac supply manholes may prove cheaper.

Circuit mileage at 380 kv on Swedish system will reach 1,900 with completion of third line in 1956.

Turbine oil fires are serious because it is not desirable to stop circulating pumps lest the turbine-generator bearings be damaged from lack of lubrication.

San Diego G&E Gets Rate Increase

The California Public Utilities Commission has granted San Diego Gas & Electric Co 89% of the $4,826,600 requested by the company or $4,315,000. This increase, the first in over 34 years for the company, will amount to about 18% of the estimated revenues for 1955.

In essence, the applicant's position was that it was not receiving a fair and compensatory return, or "a return sufficient to induce the investment of additional capital which is essential for its construction program, as well as to provide the cost of additions and betterments which will become necessary from time to time in the future, in order to provide adequate service to its customers."

"The greatest capital expenditure," the order said, "in the applicant's history in 1954 and a sizeable increase in fuel cost for 1955, as well as the other cost increases, are added conditions which applicant estimates will lower its electric department rate of return to below 4.0%. The increased revenue sought by applicant is designed to increase its electric rate of return to 5.9%."

Expenses: As to allowable expenses, there were no major differences between the applicant and the staff. However, under administrative and general expenses, the order noted that "the applicant included in administration and general expense for rate-fixing purposes all dues and contributions whether charged to expense or to income. The staff, following precedents established by former decisions of the commission, excluded such items as service club dues and miscellaneous donations, but included one half of contributions paid Red Cross, Community Chest, and Chambers of Commerce."

Cost of Service: The order noted that "applicant retained a consulting engineer to prepare cost of service analyses. The results of the cost analyses as set forth in Exhibits Nos. 6 and 7, are expressed as rates of return by classes of service for the pro forma year 1955 under present and proposed rates in the tabulation following:

Class of Service	Rate of Return with Present Rates	Proposed Rates
Residential	3.56%	5.63%
Commercial	7.26	9.34
General Power	4.74	6.36
Agricultural Power	0.84	2.84
Street Lighting	0.43	2.87
Municipal Power	0.35*	1.56
Resale	6.15	7.96
Large Industrial	2.12	2.84
Electric Department	4.05	5.90

* Red Figure

Rate of Return: The commission took note of the rapid growth of the applicant's property and said: "The rate of return should be at a level that will permit applicant to perform its public duty, maintain its credit, attract capital and finance the expansion of facilities reasonably necessary to render adequate service to present and prospective customers. Upon a careful consideration of the evidence before us we are of the opinion and find that a rate of return of 5.9% is fair and reasonable for applicant's electric department. Should the earnings materially exceed the estimates, appropriate adjustments can readily be considered at the time of further hearings herein."

Rate Base: The difference in the rate base between the staff and the applicant amounted to .06%, or an inconsequential amount."

Applicant's Exhibit No. 27 shows a breakdown of unit costs by classes from which the following figures were derived based on each class yielding a uniform 5.9% rate of return:

	Demand (Excess) Per Kw-Year At Trans. Input	Commodity, Per Kwhr Sold	Customer, Annual Avg. Per Cust.
Residential	$36.43	0.92¢	$ 23.58
Commercial	36.43	0.89	46.82
General Power	36.43	0.89	62.36
Agricultural	36.43	0.93	119.93
Large Industrial	35.21	0.85	3,927.78
Street Lighting	36.43	0.95	2,108.97
Municipal Power	36.43	0.89	15,900.00
Other Resale	25.02	0.65	19,866.67
System Average	$35.92	0.88¢	$ 31.93

"The California Manufacturers Association was interested in the cost analysis and would prefer to use a method whereby the fixed charges are considered as demand costs and the variable charges are considered as commodity costs after deducting the customer costs. The method used by the consulting engineer is known as the load-factor method in which, after deducting the customer component and after directly assigning certain expenses such as fuel, the remaining fixed charges and operating expenses are segregated on the basis of the average demand and excess demand.

"The average demand portion is considered as a commodity cost. This is predicated on the theory that it takes one kilowatt of machinery operating one hour to produce one kwhr of energy. However, since systems operate at lower load factors than 100% the utility must install excess capacity to handle the peak loads above the system average load.

"The Association introduced Exhibit No. 39 to show that there were certain so-called errors as between classes due to 'over-lapping' under the method used by the consultant. However, the maximum class difference shown was 3.38% in the excess demand column. This amount is not viewed as serious and would not materially change the general conclusions to be drawn from the cost study. The other exhibit presented by the association (Exhibit No. 37) was a hypothetical example to illustrate the effect of using a load factor based on a coincident demand rather than on the non-coincident demand in the computations."

(Continued on next page)

San Diego Rate Hike

(Continued from previous page)

Conclusions: In its conclusions, the commission said: "While counsel for the City of San Diego and other cities urged that any increase be denied on the grounds that earnings are only temporarily depressed, we do not find that revenues are increasing so much faster than the applicant's or staff's estimate that such action appears to be justified. Applicant originally requested an increase of $4,826,600 and we have found an increase of $4,315,000, or 89% of the original request, to be fair and reasonable."

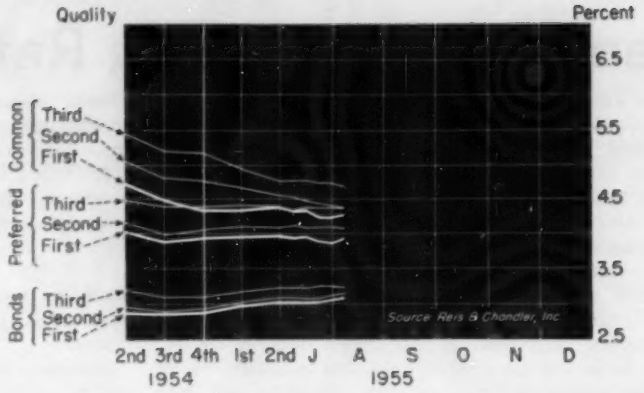
FINANCIAL BRIEFS

Pacific Power & Light Co is planning to sell $10 million in bonds and $3 million in serial preferred stock to build a 115-kv transmission line in Montana and a steam plant in Wyoming, along with two 115-kv lines in Washington and Oregon, Pres Paul B. McKee has reported. Montana line will connect company system at Libby with Bonneville Power Administration system at Troy. Ample fuel in Wyoming makes competitive steam generation possible. Steam plant will be completed in 1958.

Equitable Securities Canada, Ltd, has sold $5,250,000 **Manitoba Hydro-Electric Board** 3¼% bonds due 1975 to the public at 99¼ to yield 3.30% . . . **Pennsylvania Power & Light Co** has received Public Utilities Commission approval to sell $25 million first mortgage bonds.

The City of Riverside, Calif., citizens have rejected California Electric Power Co's offer to purchase its municipal light department at a special election August 2, by a vote of 9,979 against the sale, and 6,298 in favor. 818 absentee votes remain to be counted. The total vote of about 17,000 (approximately 70% of the total 24,181 registered voters) was an unusually heavy turnout at the polls for a city election. A Cal-Electric official made following statement on the defeat "the campaign on the part of the opposition was one of confusion of issues rather than refutation of facts, but the people have made their choice."

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Aug. 4	3.08	3.13	3.25	3.95	4.06	4.36	4.27	4.36	4.68
July 28	3.08	3.12	3.25	3.93	4.05	4.37	4.25	4.37	4.71

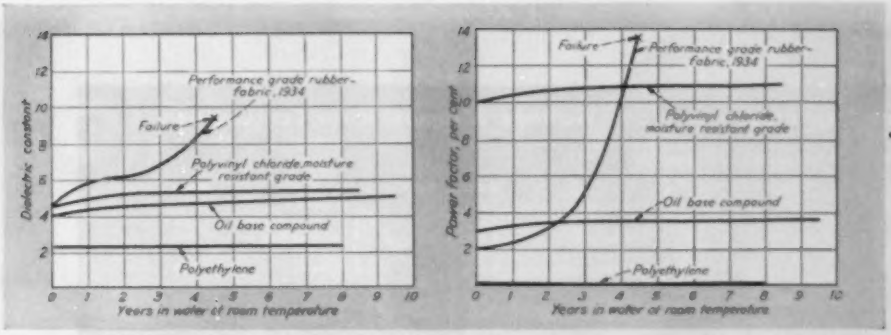
Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Baltimore Gas & Electric	12	June	$13,579,000	$10,302,000	$2.15(a)	$1.69(a)
Central Power & Light	12	June	6,775,173	6,034,892	.....	.....
Dallas Power & Light	12	June	6,929,200	5,117,786	.....	.....
Delaware Power & Light	12	June	4,810,023	4,485,292	2.16	1.99
Gulf States Utilities	12	June	10,016,928	9,364,441	2.01	1.85
Kansas City Power & Light	12	June	7,227,289	6,448,329	2.15(b)	2.11(b)
Middle South Utilities, consolidated	12	June	16,972,398	14,785,056	2.23(c)	2.08(c)
Montana Power and subsidiaries	12	June	8,043,930	7,514,237	2.78	2.63
Northern Indiana Public Service	12	June	10,956,237	9,444,755	2.64(f)	2.26(f)
Public Service of Indiana	12	June	12,485,056	12,064,120	2.43	2.34
Public Service of Oklahoma	12	June	6,198,808	5,613,462	.....	.....
Texas Electric Service	12	June	10,497,644	9,597,255	.....	.....
Texas Utilities, consolidated	12	June	23,882,878	20,018,490	4.04	3.39
Virginia Electric & Power	12	June	18,346,073	14,394,581	2.44(g)	2.02(g)

Notes—(a) Based on average number of shares; (b) Based on 2,695,000 shares in 1955 and 2,450,000 shares in 1954; (c) Based on 7,600,000 shares in 1955 and 7,125,000 shares in 1954; (f) Based on 3,593,778 shares in 1955 and 3,489,046 shares in 1954, and (g) Based on 6,600,000 shares in 1955 and 5,999,980 shares in 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUB IC
SCHEDULE FOR AUGUST—SEPTEMBER			
BONDS			BID DATE
California Electric Power—1st mtg due 1985	$6,000	.....	Aug. 30
Utah Power & Light—1st mtg due 1985	15,000	.....	Sept. 13
Ohio Power—1st mtg	17,000	.....	Sept. 20
Pacific Power & Light—1st mtg due 1985	10,000	.....	Sept. 27
PREFERRED STOCK			
Public Service Electric & Gas—250,000 sh $100 par	$25,000	.....	.....
Ohio Power—60,000 sh $100 par	6,000	.....	Sept. 20
COMMON STOCK			
California Electric Power—230,000 sh	.....	.....	Aug. 23
Housatonic Public Service—14,817 sh (to be offered commonholders on 1-for-25 basis, record Sept. 5 to expire Sept. 26)	.....	.....	.....
Utah Power & Light—177,500 sh	.....	.....	Sept. 13



CURRENT TRENDS

No. 3 in a series of articles

These graphs show some long-time 1000-cycle test results on typical insulations. Time consumed retards development of new types. The text explains limitations of accelerated tests and how interpretation is affected by application.

Moisture Resistance of Cable Insulations

In sharp contrast to the situation only 15 to 20 years ago, moisture need no longer be considered a serious hazard to cable operation.

Two factors have helped materially in the relatively rapid attainment of this present degree of protection: (1) New insulating materials and compounds have been developed which possess an inherent high degree of moisture stability; (2) Short-term laboratory test methods now help to evaluate moisture resistance correctly and thereby speed the development of the newer insulating materials.

Metallic sheaths—pro and con

A continuous metallic covering, such as lead sheath inherently provides complete moisture protection to the underlying insulation. But a metallic sheath is not always advisable or practicable. Hazards such as electrolysis, corrosion, vibration, plus added weight and economic factors often nullify its usefulness. This seems to be more the rule than the exception.

Because of these problems presented by metallic sheaths, attention turned to the study of the ability of the conductor insulation itself and nonmetallic coverings to withstand water and moisture. These studies involved the theories of mechanics of moisture attack, effects of environmental conditions, methods of test, and evaluation of insulating materials and coverings with particular relationship to actual performance and experience.

Theories

The mechanics of water absorption have been comprehensively investigated. While there is a lack of agreement in terms of actual operation, it is generally agreed that there are at least two physical methods by which water might affect insulation: by actual "absorption" and "diffusion."

"Absorption" is a direct layer effect in which the successive outer layers of the insulation gradually become water-soaked. Tests for increased weight or electrostatic capacitance of the dielectric reflect changes by absorption.

"Diffusion"—more difficult to measure—takes place when water permeates the insulation and establishes irregular conducting paths of water from the conductor to the outer surface. Its study involves additional parameters such as pressure and rate. A weight test would not disclose "diffusion" but some sensitive electrical quantity such as insulation power factor or resistivity might be related to it.

The effect of moisture upon cable characteristics can probably be best explained in terms of its electrical action which provides a direct determination. The insulating properties of a dielectric are adversely affected by the conducting properties of the water.

The determining feature for any insulation operating under an alternating current stress is its electrical stability. For as soon as its insulation becomes erratic under a particular set of circuit conditions, a cable's usefulness to that circuit is ended. For a power cable, complete electrical instability is reached when dielectric losses become excessive enough to permit actual thermal failure. For a communication cable, this point is reached when attenuation constants increase so much that an acceptable level or quality of signaling cannot be maintained.

In cable insulation it is not so much a question of "how much" water, as "where" it is. The ultimate criterion in the penetration of water through cable insulation, therefore, *is its effect upon the electrical stability of the cable—all other effects being of secondary importance.* The longer the electrical properties of an insulation remain relatively constant in the presence of water, the better is the true moisture resistance of that insulation.

Long-term unaccelerated moisture tests have been fundamental and helpful in adding to the knowledge of moisture absorption. But a minimum of two years' immersion period has usually been necessary to establish whether or not an insulation was truly electrically stable—and many such tests have been continued on many types of insulations for 5-year periods and longer. Something of a more practical nature was obviously needed and several short-term test methods, based upon electrical measurements were devised and found to give a relatively truthful index of moisture resistance.

Test methods

One such short-term test control is the temperature of the water bath. This has been found to have a substantial accelerating influence, although certain caution is needed in establishing a maximum test temperature that will not alter results because of chemical or physical changes. For most materials and purposes, a bath temperature of 50° C. has been found satisfactory. Further, the effects of thickness of insulation are reflected in the rate of change of electrical properties. Relatively thin walls (preferably not less than 1/32") will disclose the effects of water much sooner than heavier walls which may require several months immersion to indicate a correct trend of measurements.

In performing electrical measurements, an increase in the applied test voltage will generally cause a truthful "acceleration." For example, measurements of power factor and capacitance at 60-cycle voltages up to 80 volts per mil of insulation thickness provide a reliable means of testing insulated conductors intended for 60-cycle power service applications.

An electrical test which consists of measurements of 60-cycle capacitance and power factor at 40 and 80 volts per mil on cable specimens immersed in water at 50° C. is now the only moisture test recommended by IPCEA for power and control cables. It is sometimes called the Stability Test. Details and limits for this and other tests are set forth in the recent IPCEA wire and cable specifications, Appendix N—Method EM-60.

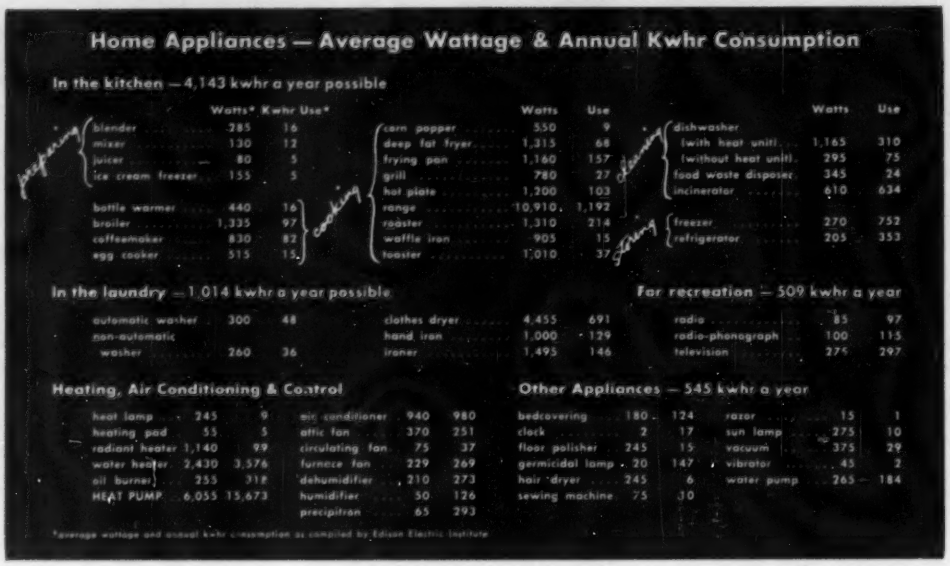
In conclusion

The various possible effects of moisture on insulation involve a careful analysis of the end use before choosing materials and design. But it is certain, at least, that specification of lead sheathed cable designs is no longer mandatory for wet locations. And there is no question that we are headed for still better moisture-resistant insulations—and better tools aiding our understanding of the problem of moisture.

For further study of this subject reference is made to a paper entitled, "What Moisture Resistance Means in Cable Insulation" by R. C. Graham, Chief Engineer, Rome Cable Corporation, which we will gladly send on request.

ROME CABLE CORPORATION, Rome, New York

STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	June	107.62	106.32	95.31	12.9
Peak—Class I Systems (million kw)	May	83.9	82.4	74.0	13.4
Estimated Dec. '55 Peak (million kw)	May	96.6	96.6	95.8	0.8
Production—billion kwhr	May	43.35	42.03	37.43	15.8
hydro		9.81	10.47	10.35	−5.1
fuel		33.54	31.56	27.08	23.8
Sales—billion kwhr	May	39.57	39.56	33.60	17.8
residential		9.71	10.54	8.88	9.4
commercial		6.18	6.14	5.68	8.8
industrial—includes sales to AEC		21.35	20.51	16.89	26.4
other		2.33	2.37	2.16	7.9
Fuel Consumption	May				
coal—million tons		10.76	10.12	8.67	24.1
oil—million barrels		4.88	5.68	4.25	14.9
gas—billion cu ft		103.43	92.82	94.70	9.3
Net Income Class A & B Co's—$ million	May	93.47	105.46	85.52	9.3

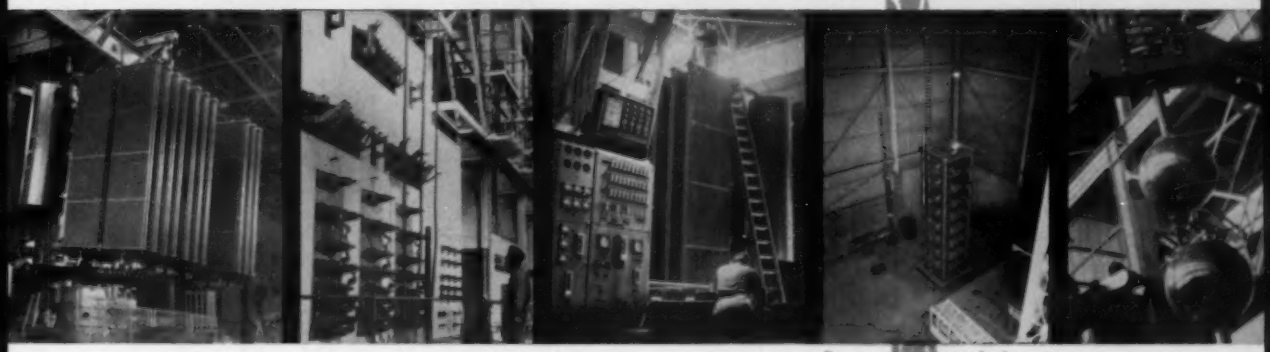
Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	June	138	138	124	11.3
ENR Construction Cost	July	138.4	137.5	135.0	2.5
BLS Cost-of-Living	June	114.4	114.2	115.1	−0.6
NEMA Sales	May				
insulation materials		154	160	116	32.8
electric appliances		110	105	89	23.6
household refrigerators		104	96	74	40.5
Wholesale prices	June				
motors and generators		120.8	120.8	123.7	−2.3
transformers and regulators		127.3	127.3	128.1	−0.6
switchgear and fuses		135.6	135.6	135.1	0.4
GNP—annual rate—$ billion	2nd Qtr.	$383.0	$375.3	$357.6	7.1

TESTING

When ordering power transformers—consideration should be given to the performance record of the manufacturer. To assure proper performance, extensive test facilities are necessary. Moloney has constantly expanded their testing facilities to maintain an enviable record of performance and reliability.

MEES-50



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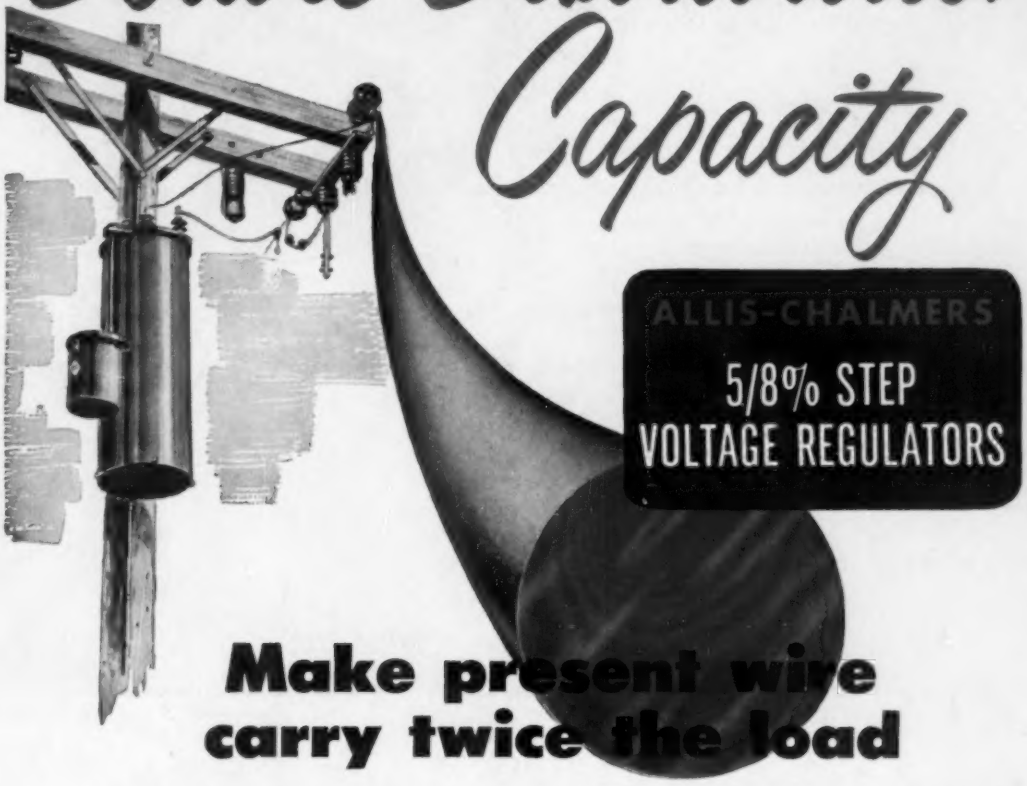

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▶ Here's how: Use all the copper in your line to carry load. Most lines have extra copper to take care of voltage drop. The extra copper isn't needed when Allis-Chalmers distribution regulators control voltage automatically.

Doubling the load doubles voltage drop. On a line with 10% voltage drop, for example, increasing the load 100% makes the voltage drop 20%. You bring this voltage drop back to 10% again by utilizing the ± 10% range of Allis-Chalmers distribution regulators.

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